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EDITORIAL NOTES

THIS, the 13th volume of the Abstracts, constitutes something of a landmark. The first twelve volumes of *Forestry Abstracts* were classified according to the Flury Decimal System, but with this first number of the new volume we start classifying the Abstracts according to the new 'Oxford System of Decimal Classification for Forestry' as commended to its member organizations by the Permanent Committee of the International Union of Forest Research Organizations at their meeting in Florence in September 1950. While the decimal coding of each individual abstract has not, for various substantial reasons, been reproduced in print from the cards flowing, at a rate exceeding 16,000 a year, into the card index of the Imperial Forestry Institute, the new Table of Contents will, it is hoped, afford a satisfactory guide to the copious cross-headings provided in the body of the Abstracts. Such as take only the separate, *Forest Products and Utilization*, will note that it comprises Sections 3, 7 and 8 of the new decimal system, so that the abstract numbers no longer form one continuous sequence in any number of that journal. Those who wish to consult the new system as a whole are requested to apply in the first place to centres of forest research and instruction in their own countries, which should already have received copies of the first edition (complete with alphabetical index) as mimeographed at Geneva. For Commonwealth subscribers, a few copies are still obtainable on direct application to this Bureau. The joint FAO/IUFRO Bibliographical Committee, which is also now a Research Section of the Union, has plans to issue a printed edition of the system in at least English, French, German and Spanish.

The second, less fundamental, change is the adoption of an improved system of transliteration for Cyrillic in place of the British Academy system hitherto used, which could be properly applied only to Russian. Beginning with Vol. 13, all Slav languages written in Cyrillic will be transliterated according to the modified Damiani system as used within the Commonwealth Agricultural Bureaux organization by e.g. the Bureaux at Cambridge, East Malling and Aberystwyth. This system transliterates all variants of Cyrillic on a uniform plan, the basis of which is the official transliteration between the Serbian (Cyrillic) and Croatian (Roman) alphabets, the latter being a close approach to the highest common denominator of orthography in Slav languages written in the Roman alphabet. It enables even those having no knowledge of the languages to reconstruct with accuracy the original Cyrillic text from the transliterated version—a point of considerable importance in bibliographical work. The following table gives the new transliterations of Cyrillic characters where different from those listed on p. 57 of the *Guide to the Use of Forestry Abstracts*, plus those of additional characters used in Macedonian, Serbian, Ukrainian and White Russian. A few obsolete letters, and those whose transliteration remains unchanged, are omitted.

Cyrillic	*Transliterated*	*Cyrillic*	*Transliterated*	*Cyrillic*	*Transliterated*
Ѓ	Ǵ	Њ	NJ	Ъ	(Bulg., medial) Ă (Russ., medial) ' Omitted when final
Ґ	Ǵ	Ћ, ћ	Ć		
Ѣ, ѣ	DJ	Ў	Ŭ		
Є	Ê	Х	H	Ы	Y
Ж	Ž	Ц	C	Ь	J
Й	Ĭ	Ч	Č	Э	È
І	Í	Џ	DŽ	Ю	JU
Ї	Ï	Ш	Š	Я	JA
Ј	J	Щ	(Bulg.) ŠT (Russ. etc.) ŠČ	Ѫ	Ą
Ќ	Ḱ				
Љ	LJ				

Thirdly, it has been decided to adopt for modern Greek the transliteration long approved by the American Library Association, as below:—

Greek	*Transliterated*	*Greek*	*Transliterated*	*Greek*	*Transliterated*
Α α	a	Κ κ	k	Σ σ	s
Β β	b	Λ λ	l	Τ τ	t
Γ γ	g [1]	Μ μ	m	Υ υ	y
Δ δ	d	Ν ν	n	Φ φ	ph
Ε ε	e	Ξ ξ	x	Χ χ	ch
Ζ ζ	z	Ο ο	o	Ψ ψ	ps
Η η	ē	Π π	p	Ω ω	ō
Θ θ	th	Ρ ρ	r		
Ι ι	i	῾Ρ ῥ	rh		

᾽ (spiritus lenis) is omitted in transliteration.

῾ (spiritus asper) is represented by the letter h.

Αι αι .. .. ai	Αϋ αϋ .. .. ay	Ηυ ηυ .. .. ēu
Αυ αυ .. .. au	Ευ ευ .. .. eu	Ου ου .. .. ou

[1] γ before γ, κ, χ = n.

Finally, as part of a move to publish the first number of all quarterly abstract journals of the C.A.B. in the first quarter of the calendar year, it has been decided to issue this volume of *Forestry Abstracts* in *FIVE* quarterly parts, the fifth and final part to appear in October 1952. In this way all four issues of all subsequent volumes, starting with Vol. 14, will appear in a single calendar year. Volume 13 with its five issues will remain at the current price for a normal four-issue volume (45*s*.).

Corrigenda and amendments.

With this number are issued (*a*) the first collected corrigenda to the *Abstracts*, (*b*) the first set of corrections and additions to the *Guide*. The latter reflect the very numerous accessions made to our coverage since the Guide's appearance last year. Readers are reminded that the Guide forms an invaluable adjunct to the Abstracts, particularly for those wishing to consult original sources.

METHODS OF TESTING THE GERMINATION QUALITY OF FOREST TREE SEED, AND THE INTERPRETATION OF RESULTS

By G. D. HOLMES, B.Sc.

THE ultimate object of any method of testing seed germination quality is to provide an indication of the percentage of seeds in a given lot that may be expected to produce plants, so as to determine the amount of seed that should be sown per unit area to give a desired plant density in the field. The examination of seed germination quality also provides a 'quality index', by which one seed lot may be compared with another, enabling bad seed to be discarded. In several countries some form of seed quality certification is required by law before seed can be offered for sale. In such cases, germination quality must be determined by actual germination of samples under controlled conditions in an approved type of germinator, or in the case of species showing dormancy or very slow germination, by an approved type of quick test.

Seed testing in its broadest sense can include examination of very many seed characteristics, but normally the determination of seed purity and germination quality is the most important. Seed purity is determined as the percentage by weight of pure seed of the species concerned, in any given lot. This determination is less important for forest tree seeds than for agricultural seeds, owing to the absence of injurious weed seeds. Nevertheless, a purity test is necessary to estimate the proportion of useless chaff and foreign matter, as this affects the sowing-density calculation and also serves as a check on the efficiency of seed cleaning.

Numerous methods for determining the viability or germination quality of seed have been evolved, and these can be conveniently divided for purposes of discussion into (1) indirect methods, depending on visual examination or the application of physical or chemical tests, and (2) direct methods, involving actual germination of the seed.

The germination value of a seed lot can be described in a number of ways; those used in this article are defined below, in order to clarify the ensuing sections on test methods and the relationship between them.

Germinative capacity is the total number of seeds that germinate in a germinator, plus the number of sound seeds remaining ungerminated at the end of the test, expressed as a percentage of the total sample.

Germinative energy is the percentage of seeds in a sample that have germinated in a germinator up to the time when the rate of germination (i.e. the number of seeds germinating per day), reaches its peak. The number of days required to reach this peak is the '*energy period*'.

Field Germination is the percentage of seeds in a sample that germinate and appear above the soil surface in the field or nursery, irrespective of later survival.

Plant per cent is the number of seedlings surviving at the end of the first growing season, expressed as a percentage of the number of seeds in the sample.

I. INDIRECT METHODS OF TESTING GERMINATION QUALITY

(*a*) *Visual examination of seed*

It is almost impossible to judge seed soundness and viability solely from the external appearance of the seed, although wrinkled, cracked or damaged seed-coats may indicate overdrying and probable loss of viability.

One of the oldest methods for obtaining a quick estimate of viability is the simple cutting test, in which non-viable seeds are distinguished by the appearance of the embryo and endosperm at the cut surface. The presence of spots in these, abnormal softness, loss of colour and freshness, and other characters uncommon in normal development, indicate loss of viability. The cutting test also shows up those seeds that are hollow, decayed or insect-infested. Because of its speed and simplicity, this method has been extensively used, particularly for large-seeded species such as Oak, Chestnut and Beech, and for species which germinate too slowly to be conveniently tested by actual germination [13].

Great care is necessary in interpreting a cutting test, as a large percentage of seed which appears healthy on cutting is not always capable of germination, owing to dormancy, immaturity, bad storage and other conditions. The cutting test is unreliable for conifers and small-seeded broadleaved species, and, as noted by Toumey and Korstian [68], it may give results that are often as much as 50% higher than those obtained from direct germination tests. With large-seeded broadleaved species the cutting test can give a useful indication of germinative capacity, but in this case also it is almost invariably an over-estimate of actual germination. In sum, the cutting test, though quick, is not considered to be as

accurate as a direct germination test, and can be most misleading if applied to seeds that are immature or have been exposed to improper storage conditions. Thus Schmidt (quoted in [13]) tested a quantity of acorns, which in December showed a viability of 93% by the cutting test. The seed was stored over winter partly in heaps on soil, and partly dry in a shed, and at the end of April the following results were obtained (Table I).

	Method of storage	
	Heaps	*Shed*
% viability estimated by cutting	92·0	72·5
Germination % in germination room	88·0	18·0
Germination % in the open	76·6	4·6

Clearly in this case the indirect test by cutting has failed to indicate loss of viability due to bad storage. In instances such as this, a determination of seed moisture content (Coleman and Boerner, quoted in [3]) will often aid interpretation of the cutting test. Other workers, e.g. Rohmeder [55] stress the importance of a determination of seed moisture content to supplement any indirect test method.

Provided that proper care is taken in interpretation, many workers consider the cutting method quite reliable. Versepuy [76] found by microscopic examination that *Abies alba* seeds in which the embryo had become detached from the endosperm, or the endosperm from the seed-coat, were incapable of germination, and that seeds with such defects developed a typical colour enabling an expert to distinguish non-viable seeds by a cutting test without the aid of a microscope. The same was found to apply to seeds of *Cedrus*, *Pinus*, *Libocedrus*, *Tsuga*, and *Pseudotsuga*. A useful description of the colour tints present on the cut surface of the seed tissues of a wide range of species was given by Busse [7]. Šefer-Safonova [62], working with acorns, concluded that an accurate estimate of viability can be made by a cutting test including ocular examination of the natural colouring of the embryo. The method was reintroduced in Germany in 1941 as a recognized procedure for estimating the viability of Beech and Douglas Fir seed [55], and a 1950 circular of the French Ministry of Agriculture officially recommends the cutting test for *Quercus*, *Fagus*, *Fraxinus*, *Cedrus*, *Acer* and *Alnus* [*]. In Belgium and Switzerland it is occasionally used as a quick method for Oak and Beech[*]. It is also used in Italy for certain small seeds (*Alnus*, *Cupressus*, *Chamaecyparis* etc.)[*]. Cutting is also frequently used for the examination of seeds remaining ungerminated at the end of direct germination tests. As moist seed is easier to cut, it is often desirable to soak seeds in water before cutting [68], or to stratify the seed for a period [52].

Crushing has been used as an alternative to cutting for some species, and was first described by Ström (quoted in [3]) as early as 1846. In 1946 Ullén [75] found that when Spruce seed is crushed on white paper, viable seeds leave an oily spot; the results obtained were found to compare well with normal methods involving actual germination.

A refinement of the cutting test was described by Heikinheimo [27]. His method, known as the embryo-ratio method, depends on actual measurement of embryo and seed size after cutting, for the assessment of seed viability. Wibeck [82] investigated this method for Scots Pine in Sweden and concluded that there is a definite correlation between germinative energy and the ratio between length of embryo and total length of the seed. More recently Voičalj [78] confirmed a definite correlation between seed size and germinability for Spruce. Macroscopic examination of seeds against a strong artificial light has been used successfully to detect undeveloped embryos in species with small, thin seeds, such as Birch (Patterson and Bunce, quoted in [3]). In 1934, Minin [39] described a technique for examining Birch seeds in which the seeds were made transparent by soaking in alcohol and glycerin.

All these methods suffer from the serious disadvantage that they rely only on the appearance of the seed. While they provide an accurate means of determining the percentage of bad or empty seeds in a sample, it is difficult to form a reliable estimate of the percentage of sound and apparently healthy seeds which are capable of germination.

(b) Methods based on measurement of physical properties of the seed

Determinations of seed weight and specific gravity have been used as a basis for estimating viability. Separation of seeds by floating has been one of the most frequently used methods. Floating has long been used for cleaning Oak, Beech, and other large seeds, but as a method of seed testing it is unreliable, since results are upset by variations in seed moisture content, wettability of the seed coat, presence or absence of wings etc., factors that do not necessarily affect viability. Burger [6] noted

that acorns which sank in water had a higher germination than the floating ones. With conifer seeds Klein (quoted in [13]) concludes that the separation is rarely complete, and that a proportion of the floating seed is frequently germinable. Flotation in liquids of different specific gravities has also been tested, and Lanquist [35] describes a floating technique using kerosene and linseed oil for separating mature and immature cones.

Seed weight and volume [1], seed odour, electrical conductivity, and the emission of heat, have all been examined as criteria for assessing viability. Waller [81] found that when an induction shock was applied, viable seed emitted an after-current ('blaze current') which could be used as an indication of seed vitality. This was confirmed by Fraser [20]. Fick and Hibbard (quoted in [3]) reported that dead seeds permit more rapid outward diffusion of electrolytes than living seeds, and that the proportion of dead seeds present can be estimated by measuring the rise in conductivity of the water in which the seeds are soaking.

The heat produced by germinating seeds was investigated by Darsie, Elliott and Pierce [10], who measured the daily average heat yield of seeds germinating under aseptic conditions in Dewar flasks. A close correlation was found for agricultural seeds between heat yield and germination.

The methods so far described suffer from the disadvantage that they rely on visible or measurable physical characteristics as an indirect measure of the physiological condition and viability of the seed. Apart from the cutting test, few of them are now in use.

(c) Methods based on the application of biochemical tests to seeds

The unreliability of visual and physical methods for rapid assessment of seed viability, led to many attempts to work out a reliable and rapid method for examining the metabolic activity within the seed.

The majority of methods for assessing viability by direct biochemical tests have made use of chemicals which, when applied to seed tissues, produce a characteristic colour reaction, according to whether the seed is live or dead. Other methods have been based on actual measurement of respiration and enzyme activity within the seed as an index of vitality. A useful review of the use of chemicals for estimating seed viability was published in *Forestry Abstracts* 1 (pp. 119–21).

(i) *Early work:* One of the earliest records of the application of chemical tests for estimating viability was that of Dimitriewicz in 1876 (quoted in [13]), who noted that sulphuric-acid solution gave a characteristic colour reaction in live barley seeds. This method was not used for tree seeds.

Neljubov [44], dissatisfied with the results of simple cutting tests, used indigo-carmine dye to distinguish living and dead seeds. His method, developed after his death by Issatschenko [29], and applied to a number of tree species by Šefer-Safonova [61, 62], depends on the ability of certain organic dyes to penetrate and stain dead tissues very much more rapidly than live ones. The technique involves extraction of the embryos from the seed before treatment with the dye. Classification of the treated embryos into categories according to the distribution of the staining, with particular attention to the root meristem, enabled estimates to be made of the percentage of live seeds in the sample. Šefer-Safonova [62] found that the method gave positive results with quick germinating species; she found also that the techniques could not be applied to acorns, as the high tannin content of the seeds prevented penetration of the dye. Gurewitsch [22] criticized the indigo-carmine method on the grounds that embryos are easily damaged in removal and the staining of damaged parts renders the results misleading. Šefer-Safonova [62], however, maintained that damaged parts could be easily recognized even though stained. It seems that Neljubov's method is considered a reliable and speedy method in Russia; Tskhoidze [70] reported that a viability test of 100 seeds took not more than two hours. In Poland, Krzeskiewicz [31], after a critical test, concluded that the method gives a useful indication of seed quality, but that the classification of the embryos into staining categories may need modification for different species. Hao [24] also found the method satisfactory.

According to Schmidt [59] and Tyszkiewicz [73] the method was applied at both the Eberswalde and the Warsaw seed testing stations, for estimating the viability of Scots Pine seed ungerminated at the end of a short germinator test (see II (*b*) below). Rohmeder [53] considers methods that work indirectly by showing up dead tissues, unreliable compared with tests giving a direct indication of biochemical activity in living cells. In this latter category are several chemical methods which are based on the ability of living cells to reduce or oxidize through respiration certain chemicals whose reduction or oxidation products have a characteristic colour. Thunberg [65] in 1920 showed that methyl blue was reduced to colourless methyl white through respiration processes in living animal cells, and later Turesson [71] attempted to use the same technique for estimating seed viability. As noted by Niethammer [46], the technique has proved unsuitable in practice for seed testing, as the methyl-blue reduction is readily reversed on exposure to atmospheric oxygen, and any controlled tests utilizing the

reaction must exclude the latter. In 1935 Gurewitsch [22] worked out a method for testing the viability of rye and wheat seeds, using the characteristic coloration produced in respiring cells by the reduction product of meta-dinitrobenzene. Eidmann [13] in 1936 reported that he was unable to produce any such colour reaction in tree seeds, as even after removal of the seed-coat the cell membranes appeared impermeable to the compound. Šefer-Safonova [62] criticized Gurewitsch's method on the grounds that the staining reaction is partly reversible, and that staining of dead tissues can occur by diffusion of stain from live cells. She, too, notes that it is difficult to apply to most tree species owing to their impermeable seed-coat and cell membranes.

(ii) *Starch-mobilization test:* In 1939, Kuznecova [33] described a method based on the observation that starch appears in Pine and Spruce embryos when germination processes begin. By initiating these processes by soaking, followed by incubation for 24 hours, and testing the embryos for starch with potassium iodide, she was able to detect those embryos in which starch was mobilized. She found that this corresponded well with germinative capacity. Schmidt [60] preferred this method to indigo-carmine or sodium biselenite (see (iii) below), since, unlike these methods, it is applied to seeds in which germination processes have begun.

(iii) *Selenium and tellurium salts:* The characteristic colour reaction following the reduction of selenium and tellurium salts when brought into contact with respiring tissues, was successfully used to indicate the viability of rye seeds by Turina [72] in 1922. Later Hasegawa (1932, quoted in [13]; 1935 [25]; 1936 [26]), using tellurium, applied the technique to tree seeds. The seed-coats were removed after a preliminary soaking in water, and the seed exposed to a solution of sodium tellurate (Na_2TeO_4). The embryos were then classified on the basis of the amount of black tellurium precipitate present. Hasegawa concludes that entirely black embryos are capable of producing plants while those of a dull colour may be germinable, but not necessarily capable of producing plants. He found close agreement between the proportion of embryos stained and actual germination in a laboratory germinator.

Hasegawa's technique was a great improvement on previous methods. It is relatively quick and easy to apply, and it was also one of the first methods to indicate that it may be possible to distinguish degrees of vigour in tree seed germination by means of a chemical test. The method aroused great interest in Germany, and Eidmann [13] in 1936, working at Eberswalde, attempted to develop Hasegawa's method for European tree species, concentrating first on Beech, in view of the difficulty of germinating it in the germinator when required. Eidmann failed to obtain satisfactory results with tellurium, and preferred selenium salts. As in Hasegawa's technique, the seed-coats have to be removed to enable the solution to penetrate. He found that acid sodium selenite ($NaHSeO_3$) was the form most easily reduced by the plant cells; it was not affected by light, and the reduction colours obtained were uniform and accurately distinguishable. Eidmann's experiments were extended to include seeds of Pine, Spruce, Douglas Fir, *Abies concolor*, and Larch. After soaking the seeds for 24 hours in 2% selenite solution, the embryos are removed and classified according to the intensity and distribution of the red reduction product. Eidmann considers that the colour intensity is proportional to the degree of respiratory enzyme activity and the general vigour and vitality of the seed. From trials with Pine and Beech seed he concludes that the staining process is sufficiently sensitive to enable the most vigorous seeds to be distinguished with a considerable degree of certainty, and for estimates to be made of germinative capacity and field germination. Schmidt [59], who was partly responsible for initiating Eidmann's work at Eberswalde, expressed great doubt as to the usefulness of the selenite method and pointed out that the respiration processes on which the method depends do not necessarily indicate that the seed is able to germinate. Schmidt's own trials on Scots Pine led him to the conclusion that as the selenite test required three days to complete, it had little advantage over a quick germination test (see II (*c*) below), which required only 4 days to give an accurate estimate of the germinative capacity of Pine. Schmidt considered that the selenite method is expensive both in material and man-hours, provides only a rough indication of viability, and gives no basis for estimating plant %. Eidmann [14], in reply, gave a more precise outline of his method, including a revised classification of embryo staining categories. He stresses that the selenite test can provide only estimates of field germination. Estimates of plant % cannot be made owing to the complex of external factors influencing early survival in the field. He considers that the main advantages of the method are that it is quick and easy to apply, and that it is completely independent of the stage of dormancy of the seed.

Further experiments with selenite, carried out by Rohmeder [53] on Scots Pine, Larch and Weymouth Pine, showed close agreement with germination % as determined by direct germination tests. This did not apply, however, to slow germinating seeds such as Douglas Fir and Beech, and in 1941 the use of selenite as an official test method in Germany for these species was abandoned in favour of the simple cutting test. These findings seem to contradict Eidmann's claim that the selenite test is

completely unaffected by the state of dormancy of the seed. Despite the good results obtained with selenite for quicker germinating species such as Pine, Spruce and Larch, Rohmeder did not consider the method necessary, since a sufficient indication of quality can be obtained by direct germination tests after 4 days for Scots Pine, 7 days for Spruce and 14 days for Larch.

Earlier, in 1938, Natlacen [43] had tested selenite on nine species and found it gave good results, and the method is now in use in Italy [*] for seeds requiring more than 30 days to germinate (*Cupressus*, *Acer*, *Fraxinus*, *Juniperus*, *Alnus*, *Quercus*, etc.). Moorhouse [41] also tested selenite for several Southern U.S. Pine species, notably *P. palustris* and *P. taeda*, and concluded that it might become a valuable testing aid. Wach [80] in 1942 confirmed by microscopic examination of embryos treated with selenite that dead tissues were not stained. He also considered selenite more satisfactory for Pine, Spruce and Beech than indigo-carmine or potassium iodide. More recently, in 1946, Žabka [85], working in Czecho-Slovakia, found that the staining of Spruce, Larch, Alder, Ash and Oak by means of selenite showed good accord with germination tests. He goes further and states that selenite provides a better index of the real state and quality of the seeds than a germination test, which usually gives higher germination values than occur in nature.

(iv) *Tetrazolium salts:* Lakon [34], working with selenite, found it distasteful because of its unpleasant odour and turned his attention to tetrazolium salts, the biochemical reactions of which had previously been studied by Kuhn and Jerchel [32]. Lakon carried out comparative trials using two new compounds, 2,3-diphenyl-5-methyl-tetrazolium chloride and 2,3,5-triphenyl-tetrazolium chloride, for testing the viability of various cereal seeds. Germinative capacity as determined by this method agreed well with actual germination tests. The tetrazolium compounds work in a similar way to the tellurium and selenium salts used by Hasegawa and Eidmann, by indicating respiratory and associated enzyme activity in living tissues. On contact with living cells the colourless tetrazolium solution is reduced to an insoluble red dye (triphenyl formazan). Unfortunately the salt in solution is sensitive to light, which acts as a catalyst in reduction, and the staining reaction must therefore be conducted in darkness. In spite of this the method has the advantage that the staining process can be completed in three hours and the salt is non-toxic.

Nadvornik [42] applied the technique to seeds of several shrubs and fruit trees and found that it worked well on all except seeds of stone fruits. Porter [49] confirmed Lakon's results for seed of a large number of agricultural crops. Cotterell [9] proposed a modification of Lakon's embryo staining classification for some cereals. Flemion and Poole [19] in 1948 examined the application of tetrazolium to seed of a large number of tree species, notably *Abies*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga Thuja*, *Tsuga*, *Taxus*, *Fraxinus*, *Acer* and *Sorbus*. Previously Flemion [16] had obtained accurate forecasts of greenhouse germination from a rapid test using the excised-embryo method (see II (*c*) below). Accordingly, in her work on tetrazolium she compares the tetrazolium estimates with the results of the excised-embryo test and only in a few cases with actual germination results in soil. Excised embryos were placed in 1% tetrazolium solution for 24 hours at 20° C. in darkness, and the embryos classified as follows according to the distribution of the staining:

Group 1—entirely stained. Group 2—at least ¾ of embryo stained. Group 3—spot staining. Group 4—unstained. Groups 1, 2 and 3 were subdivided according to the intensity of staining. The results obtained by Flemion and Poole showed fair agreement between the estimated germination percentage determined as the sum of embryos in Groups 1, 2 and 3 of the chemical test, and the germination percentage determined by the excised-embryo method. The closeness of the correspondence, however, varied considerably with species, and the authors state that much more detailed work is required before the tetrazolium technique can be applied with confidence to any given species.

Recent work (unpublished) by the Research Branch of the U.K. Forestry Commission, shows that for Scots Pine, Spruce and Larch, estimates of seed viability obtained by using 2,3,5-triphenyl tetrazolium bromide, correspond fairly well with the results of sodium-biselenite and indigo-carmine tests. Krzeszkiewicz's embryo classification for indigo-carmine gave estimates of viability that were low compared with tetrazolium estimates. Eidmann's revised embryo classification for sodium biselenite gave slightly closer results, but they were still low compared with the tetrazolium figures. In 1949 and 1950, extensive trials were made with Corsican Pine, Japanese and European Larch, Sitka and Norway Spruce, using tetrazolium, to establish the relationship between the several embryo staining categories, germinative capacity in the germinator, and field germination under a variety of nursery conditions. Close agreement was obtained, for all species tested, between the percentage of embryos stained on over 5/6 of their surface and the actual laboratory germination % after 30 days. The percentage of embryos entirely and intensely stained, gave a reasonable approximation of actual germination in the field, without taking account of survival after germination. Examination of test results from five separate seed origins of each of the above species, all of which were later sown in several forest

nurseries, confirmed this relation. Out of a total of 50 separate sowings of each species in each of five nurseries the difference between estimated and actual germination was less than 10% in the following percentage of cases. European Larch—95%; Japanese Larch—80%; Corsican Pine—75%; Norway Spruce—70%; Sitka Spruce—50%. Rohmeder [55] reports that the tetrazolium test is used at the Munich Forest Research Institute for quick testing of Beech seed. He notes that in Beech, the number of fully stained seeds corresponds with the number germinating in a germinator, but caution is necessary in interpreting the results, as the staining reaction with tetrazolium is not upset by variations in seed moisture content. Clearly seed which has been allowed to dry in storage will not germinate well, and Rohmeder considers it necessary to supplement the tetrazolium test with a seed-moisture determination in cases where drying may have occurred.

The tetrazolium method has the advantage that it gives a bright and clear-cut staining reaction and there is normally little difficulty in embryo classification. The method is used for tree seeds in several countries, principally for species having dormant or slowly germinating seeds which require a long period to test by normal germination methods. Thus it is used for Peach, Plum, Cherry and other dormant seeds in Denmark and for *Pinus*, *Quercus*, *Acer* and *Taxus* in Holland [*]. It has recently been introduced in France as a rapid test for some species, notably *Alnus* [*]. In Britain the tetrazolium test is used for seed of most conifers, but results are always checked by an actual germination test; it is also applied as a routine test to sound seeds remaining ungerminated at the conclusion of a germinator test.

(v) *Measurement of respiration and enzyme activity:* Actual measurement of the amount of CO_2 evolved in respiration has been tested by several workers as a possible expression of seed viability. Qvam, (quoted in [3]) investigated this method for cereals in 1906, and later the technique of determination was improved and described by Tashiro [64]. The method, however, proved difficult and unreliable, as the rate of respiration varies greatly according to external factors of light and temperature, and also the seed moisture content.

The methods so far used for determining the activity of particular enzymes in seed tissues as an index of viability have depended on the detection of oxidizing and reducing systems in living cells. Thus the detection of oxidase by means of gum guaiacum solution was tried by Hasegawa (quoted in [3]). Similarly for catalase, which is generally supposed to be universally present in all living tissues, Crocker and Harrington (quoted in [38]) demonstrated a close agreement between catalase activity and respiration rate. Later Němec and Duchon [45] found a close correlation between catalase activity in dry seeds and germination. Gračanin [21] regarded this method as unreliable, as he was able to demonstrate that seeds can be artificially killed without destroying catalase activity. Similarly de Vilmorin and Cazaubon [77] applied this technique to Pine and Larch and found considerable amounts of catalase in dead seeds. Schmidt [56, 57] considered that the catalase test provided a satisfactory quick method for deciding whether a seed lot is good, average or poor, but it could not be regarded as a substitute for an actual germination test. This view was supported by Eidmann [13].

The value of rapid viability tests has been much discussed and it is generally agreed that at least some of them, notably the chemical staining methods, can serve a useful purpose, particularly for seed of species which show dormancy or are too slow germinating to be conveniently tested in a germinator. Regarding the reliability of the rapid indirect methods, several, notably selenite and tetrazolium, have been developed to the stage where a reasonable prediction of laboratory germination can be made.

II. Direct Methods of Testing Germination Quality

(*a*) *Apparatus and germinating medium*

The true germination quality of seed can only be determined by actually germinating a representative sample, and where legal certification of seed quality is required this is normally the method used. The aim is to determine the germinative capacity of the seed under controlled, uniform, and repeatable conditions, the moisture, temperature and light conditions being maintained as near as possible to the optimum for the species under test. These conditions are quite unlike those to which the seed will be exposed when it is sown in the nursery, and it has often been suggested that the conditions in a germinator should be similar to those likely to be encountered in the field, as the test results would then show a closer approximation to the results of field sowings. In practice it is extremely difficult to conduct the latter type of test owing to the great variety of field conditions. Tests are therefore done under controlled near-optimum conditions for the species concerned. The results provide an index of seed quality by which one seed lot can be compared with another, and which can serve as a basis for estimating field germination. The chief disadvantage of direct germination tests is their duration, particularly for slow germinating species such as Douglas Fir and species such as Beech, Oak and several Pines, which show dormancy.

METHODS OF TESTING THE GERMINATION QUALITY OF FOREST TREE SEED

Many types of germinating apparatus for testing tree seeds have been devised, any apparatus giving control over temperature, moisture and light, being suitable. The types of germinator which have been used, can be conveniently divided into two groups according to the germinating medium employed. The first makes use of a natural germinating medium such as peat, sand or soil; the second uses an artificial medium such as blotting paper, porous clay plates, asbestos or flannel pads.

Toumey and Korstian [68] prefer the first type, considering that the most reliable estimates of field germination are obtained with natural media, and for this reason tests in soil under greenhouse conditions are now accepted by the U.S. Forest Service as the most useful. A detailed description of the technique of soil and sand tests was given by Toumey and Stevens [69] and Dunlap and McDonnell [11]. Soil or sand tests under controlled conditions are generally accepted as preferable for larger-seeded species such as many of the hardwoods, since it is difficult to ensure an adequate moisture supply by placing the seeds on a flat surface of blotting paper or flannel. The main disadvantage of sand or soil methods is the variability of results owing to the difficulty of controlling moisture conditions in the medium. Germinators with an artificial germinating medium are more extensively used; they require less space, and it is simple to maintain aseptic conditions and to control moisture and temperature. Details of many of the types devised can be found in Rohmeder [51], Baldwin [3], and Toumey and Korstian [68]. The apparatus most widely employed in Europe is the Copenhagen tank or Jacobsen germinator [30]. In this the seeds are germinated on blotting-paper or filter-paper pads kept uniformly moist by absorbent paper or cloth wicks, which supply moisture by capillarity from a constant-temperature water bath. A modified form of the Jacobsen germinator was devised by Larsen [36] and Toumey [69], incorporating features for the maintenance of high atmospheric humidity round the seeds. Baldwin [2] describes a modification consisting of a single glass jar with the germinating pad at the top. This has proved useful in experimental work where it is desired to transfer single tests from one condition to another. Germinators using absorbent clay or porcelain plates as the germinating medium have been used with success for tree species. Stainer's apparatus [12] and the Rodewald apparatus [51] were of this type.

All the above types of germinator include provision for the control of temperature at the germinating surface. It has been found [5, 86] that a controlled fluctuation between night and day temperatures is more favourable to germination than a constant temperature over each twenty-four hours. Rohmeder [55], concludes, after observations on a wide range of species, that an alternating temperature is in many cases more favourable than a constant one, but the effects vary so much with species and other factors that no generally valid conclusion can be drawn. In the majority of European testing stations an alternating temperature is used for conifer species, with the maximum temperature between 25 and 30° C.

The merits of different types of germinator depend on the species considered. In most countries the Copenhagen tank is the commonest apparatus for small-seeded species, while in others more use is made of soil and sand tests. Detailed comparisons between the Jacobsen and sand-type germinators were made by Toumey and Stevens [69] and Heit and Eliason [28], showing that in general, Jacobsen's gave the highest germination capacity with the least variable results. There was, however, great variation in the response of different species. Rohmeder [55], at Munich, comparing the Rodewald, Jacobsen and sand methods for Scots Pine, Norway Spruce and European Larch, showed small differences between the methods. Examination of the (unpublished) test results over a period of 9 years by the U.K. Forestry Commission has shown that for Scots Pine, Corsican Pine, Japanese Larch and Douglas Fir the Jacobsen gives higher germinative-capacity and germinative-energy values than the sand test. For European Larch, Norway Spruce and Sitka Spruce, the results have been variable, and no method can be said to be better than another.

(*b*) *Duration of normal germinator tests*

The duration of a germinator test depends on the species under test and the apparatus used; thus Rohmeder [51] stated the following as the periods required for determining germinative capacity in the Copenhagen tank in Germany:—

Scots Pine, Norway Spruce, Alder, Birch . .	21 days
European Larch, Maple, Beech, Ash, Oak, Hornbeam	28 „
Abies spp., Austrian Pine	42 „
Elm	60 „
Douglas Fir	72 „

There are, as yet, no internationally accepted rules on this point, and the accepted test periods differ

slightly from one country to another. At the conclusion of a germinator test, seed remaining ungerminated is normally cut open and the number of sound seeds present is added as a separate figure to the germination percentage, e.g. germinative capacity = 70% + 8. In some stations a chemical staining test is used in place of the cutting test on ungerminated sound seeds. Indigo-carmine has been used in the Eberswalde and Warsaw seed testing stations, and tetrazolium in Britain.

(*c*) *Rapid tests*

Schmidt [58] considered that for some species such as Scots Pine and Spruce, which germinate readily, a sufficient indication of seed quality can be obtained from the germination % after as short a period as 4 days. Rohmeder [53] also suggested that a pre-estimate of germination quality based on a short test of 4–7 days for Pine and Spruce, and 10–14 days for Larch, is quite reliable, constituting a more satisfactory rapid test of viability than any of the chemical staining methods. Tirén [66, 67] investigated the relationship between laboratory germination % after 10 days, and germinative capacity, for Scots Pine and Spruce. He concluded that germinative capacity can be calculated from an equation with only two independent variables, namely germination % after 10 days and the percentage of sound seeds remaining ungerminated.

The practical difficulties of carrying out direct germination tests on dormant or slow germinating seed, led to the work of Flemion [15] and Baldwin and Flemion [4] with an excised-embryo technique for obtaining a rapid estimate of viability in *Pinus strobus*. Seed was mixed with moist peat for 5 days, and the embryos removed and placed on moist filter paper in Petri dishes. Observation of the development of the embryos enabled a good estimate of germinative energy to be made within 10 days compared with the 7 weeks' period required with the normal germinator method. Flemion [17, 18] later tested the method on 58 species and stated that, for nearly all, there was close agreement between the results of the rapid excised-embryo test and the normal germination test. Porter [49] considered the method one of the most practical and successful means available for rapid assessment of viability.

(*d*) *Relationship of test results to field germination and plant %*

The relationship of germination test results to field germination and plant %, varies considerably with the germination conditions in the field, and it is difficult to forecast field results accurately even for sites where information is available on the results of past sowings. Haack [23] investigated this relationship and was the first to introduce the term germinative energy. He considered germination energy a better expression of field germination than germinative capacity, on the theory that only those seeds which germinate rapidly and vigorously under the favourable conditions in a germinator are likely to be capable of producing seedlings in the field, where weak or delayed germination is so often fatal. Haack prepared tables for Scots Pine, showing the relationship between germinative energy % and plant % for favourable and unfavourable nursery conditions. From his data he was able to calculate the amount of seed to be sown per unit area in order to produce the desired seedling stocking at the end of 1 year.

The usefulness of germinative energy % as an expression of the probable field performance of seed was confirmed by Wiebecke [83] in Germany, and by Bates [5], Toumey and others in the United States.

Later Schmidt [58] prepared similar tables for Scots Pine and Spruce, based on his experiments at Eberswalde. The work of both Haack and Schmidt showed that plant % was invariably lower than germinative energy %, owing partly to loss of seedlings through various causes during the season. They also showed that the discrepancy between the two values was the greater, the lower the germinative energy. It was presumed that the factors responsible for the non-viability of certain seeds in a bad lot would also have lowered the viability or vitality of the remaining viable seeds, i.e. viable seeds in a bad seed lot have a lower degree of vitality than viable seeds in a good lot.

Minin [40] also confirmed Haack's results; working on Scots Pine and Spruce, he showed that among seeds of the same germinative capacity those with the higher germinative energy gave the higher plant %, and concluded that germinative energy constitutes the most reliable criterion of field germination and is a useful indication of the plant %. In 1946, Petrov [47], in Bulgaria, urged the adoption of a 7-day test period for assessing the germinative energy of Scots Pine, *Pinus nigra* and Norway Spruce, as the best index of field germination. In Poland Włoczewski [84], prepared graphs for Scots Pine from which the sowing density required to produce any desired seedling stocking could be read off from the observed laboratory germinative capacity and germinative energy. He also introduced a correction factor to take into account the effect of good, medium and poor soil conditions. Tyszkiewicz [74], also noted the importance of both germinative energy and germinative capacity in determining field germination;

in Poland, Scots Pine and Spruce seed is divided into standard quality classes as follows, according to the capacitv and energy values:—

Germinative		
Capacity	*Energy*	*Quality class*
100–90	100–80	1
,,	79–72	1–2
,,	71–60	2
89–80	89–60	2
,,	59–45	2–3
79–70	79–35	3

Read [50] recommended that germinative energy be used as the basis for estimating plant %, with due consideration of the possible effects of other factors. He suggested that from nursery records over a period of years it should be possible to prepare a plant-% table for any species, based on germinative energy alone. Suchecki [63], however, took the opposite view, and showed how greatly site and climatic factors can influence both plant % and field germination %. He considered that the effect of outside factors is so great, and so variable according to site and season, that it is not possible to find a reliable basis for comparing laboratory results with field results.

Reference must also be made to the work of Derlitzki (quoted in [3]), who described a 'sprouting power' test (*Triebkraftprobe*) in which seeds are germinated through a covering of 1 cm. of coarse sand of standard particle size. By eliminating the weaker plants which are incapable of emerging through the sand, the method affords a more rigorous test of seed quality than other direct methods, and Rohmeder [55] referring to Scots Pine, considers that it gives a closer estimate of field germination.

It is generally agreed that because of wide variations from one site to another in the conditions influencing germination and survival, past data on field germination and plant % must be available before any reliable estimates can be made from test figures. Where such data are not available, a useful measure of the number of seedlings that can be expected from a pound of seed under reasonably favourable conditions in the nursery, can be obtained from the germinative energy of the seed together with its purity % and the number of seeds per pound.

(*e*) *Sampling procedure*

As seed tests are carried out on relatively small samples from bulk seed lots, special attention must be paid to the sampling procedure in order to ensure that a representative sample is taken. Germination tests are normally carried out on two or more sub-samples of the sample submitted, and the variation between sub-samples provides an indication of the reliability of the resuits. In order to ensure a standard of reliability, tests are normally repeated if the variation between sub-samples exceeds a certain 'tolerance' figure. The accepted tolerance figures vary with the quality of the seed: the poorer the quality, the larger will be the expected sampling error. The application of statistical methods to seed testing is discussed in detail by Collins [8], Leggatt [37], Tyszkiewicz [73], and Porter [48].

III. Present Use of the Various Methods

As regards the application of various test methods by forest seed-testing stations in different countries, the direct germination test remains the main method for estimating germination quality. There is a general trend to use germinator methods wherever possible, and much interest is being shown in the possibility of speeding up the results with these methods by using the results after a short period in the germinator as an index to germinative capacity. Some stations, notably in Belgium, Poland, Sweden, Switzerland and the United States, use a germinator test for most species, while in other countries, notably Britain, Denmark, France, Holland, Italy and Spain, germinator methods are confined to the species that germinate readily. For species difficult or slow to germinate in a germinator, a simple cutting test is sometimes used. This is applied in France to Oak, Beech and Ash; it is also used occasionally as a quick test in Belgium and Italy, but on account of its unreliability, it is usually followed by chemical staining or a direct germination test. Much interest has been shown in chemical staining methods as a possible means of obtaining a quick and reliable estimate of seed viability, particularly for dormant and slow germinating species. The sodium biselenite test is applied in Italy for seed remaining ungerminated after 30 days in the germinator. It is also used in Spain as a test method for some large-seeded conifers. The tetrazolium test is more widely used; it is applied in Denmark and Holland for seeds with pronounced dormancy, and is being tested in France for difficult species such as *Abies*. It is in use in Britain for most conifers, to provide an interim quick result which is later checked by a direct germination test.

REFERENCES

[*] Private communication.
[1] Amilon, J. A. (1923). Skogsskötseln och dess förutsättningar. Albert Bonnier, Stockholm.
[2] Baldwin, H. I. (1930). *Science* 72 (345–6).
[3] „ „ (1942). Forest tree seed. Chronica Botanica Co., Waltham, Mass., U.S.A. [*For. Abstr.* 4 (163).]
[4] „ , and Flemion, F. (1941). *Fox For. Notes* No. 30. [*For. Abstr.* 3 (126).]
[5] Bates, C. G. (1913). *Proc. Soc. Amer. For.* 8 (127–38).
[6] Burger, H. (1921). *Mitt. schweiz. Anst. forstl. Versuchsw.* 11 (306–77).
[7] Busse, J. (1929). Forstlexikon. Paul Parey, Berlin.
[8] Collins, G. N. (1929). *Circ. U.S. Dep. Agric.* No. 79.
[9] Cotterell, H. T. (1947). *Nature* 159 (748).
[10] Darsie, M. *et al.* (1914). *Bot. Gaz.* 58 (101–36).
[11] Dunlap, A. A., and McDonnell, A. D. (1939). *J. For.* 37 (330–2). [*For. Abstr.* 1 (87).]
[12] Eberts, E. (1884). *Allg. Forst- u. Jagdztg.* 60 (371–2).
[13] Eidmann, F. E. (1936). *Z. Forst- u. Jagdw.* 68 (422–43).
[14] „ „ (1938). *Deutsche Forstwirt, Berlin* 20 (445–9; 457–60).
[15] Flemion, F. (1936). *Contr. Boyce Thompson Inst.* 8 (289–93).
[16] „ (1938). *Contr. Boyce Thompson Inst.* 9 (339–51).
[17] „ (1941). *Contr. Boyce Thompson Inst.* 11 (455–64). [*For. Abstr.* 3 (125).]
[18] „ (1948). *Contr. Boyce Thompson Inst.* 15 (229–41). [*For. Abstr.* 10 (No. 2556).]
[19] „ , and Poole, H. (1948). *Contr. Boyce Thompson Inst.* 15 (243–58). [*For. Abstr.* 10 (No. 2557).]
[20] Fraser, M. F. (1916). *Ann. Bot., Lond.* 30 (181–9).
[21] Gračanin, M. (1926). *Annales de la science agronomique, française et étrangère, Paris* 43 (430–8).
[22] Gurewitsch, A. (1935). *Bericht der Deutschen Botanischen Gesellschaft, Berlin* 53 (303–18).
[23] Haack, O. H. A. (1909). *Z. Forst- u. Jagdw.* 41 (353–81).
[24] Hao, K. S. (1939). *Z. Forst- u. Jagdw.* 71 (141–56; 187–204; 249–69). [*For. Abstr.* 1 (87).]
[25] Hasegawa, K. (1935). *Proceedings of the International Seed Testing Association, Rome* 7 (2), (148–55).
[26] „ (1936). *Jap. J. Bot.* 8 (1–4).
[27] Heikinheimo, O. (1915). *Acta for. fenn.* 4 (1–20).
[28] Heit, C. E., and Eliason, E. J. (1940). *Tech. Bull. N.Y. St. agric. Exp. Sta.* No. 255. [*For. Abstr.* 3 (302).]
[29] Issatschenko, B. (1931). *Fortschritte der Landwirtschaft, Wien* 6 (257–8).
[30] Jacobsen, I. (1910). *Cbl. ges. Forstw.* 36 (22–8).
[31] Krzeszkiewicz, W. (1939). *Rozpr. Spraw. (Ser. A) Inst. Bad. Leśn.* No. 44. [*For. Abstr.* 1 (87).]
[32] Kuhn, R., and Jerchel, D. (1941). *Ber. dtsch. chem. Ges.* 74 (949–52).
[33] Kuznecova, M. S. (1939). *Lesn. Hoz.* No. 6.
[34] Lakon, G. (1942). *Bericht der Deutschen Botanischen Gesellschaft, Berlin* 60 (229–305; 434–44).
[35] Lanquist, K. B. (1946). *J. For.* 44 (1063–6). [*For. Abstr.* 8 (No. 2387).]
[36] Larsen, J. A. (1918). *J. For.* 16 (690–5).
[37] Leggatt, C. W. (1939). *Bot. Rev.* 5 (505–29). [*For. Abstr.* 1 (123).]
[38] Lehmann, E., and Aichele, F. (1931). Keimungsphysiologie der Gräser. Ferdinand Enke, Stuttgart.
[39] Minin, D. (1934). *Opyty i issledovanija vsesojuznogo naučno-issledovateljskogo Instituta Agrolesomelioracii* 2 (90–106).
[40] „ (1936). *Trud. vsesojuz. nauč.-issled. Inst. Agrolesomel.* 7 (57–72).
[41] Moorhouse, R. B. (1938). *N.Z. J. For.* 4 (185–9).
[42] Nadvornik, J. (1946). *Věstn. čsl. Akad. zeměd.* 20 (160–4).
[43] Natlacen, G. (1938). *L'Alpe* 25 (16–20).
[44] Neljubov, D. N. (1929). *Actes du Vème Congrès International d'Essais de Semences, Rome* (400–4).
[45] Němec, A., and Duchon, F. (1922). *C.R. Acad. Sci., Paris* 174 (632–4).
[46] Niethammer, A. (1929). *Öst. bot. Z.* 78 (264–78).
[47] Petrov, V. (1946). *Gorsko Stopanstvo* 2 (2–9). [*For. Abstr.* 10 (No. 1774).]
[48] Porter, R. H. (1945). *Res. Bull. Ia. agric. Exp. Sta.* No. 334.
[49] „ (1949). *Bot. Rev.* 15 (221–344). [*For. Abstr.* 11 (No. 240).]
[50] Read, A. D. (1940). *J. For.* 38 (740–1). [*For. Abstr.* 2 (211).]
[51] Rohmeder, E. (1938). *Forstwiss. Cbl.* 60 (218–34; 244–54; 265–78).
[52] „ (1938). *Forstwiss. Cbl.* 60 (739–41).
[53] „ (1940). *Allg. Forst- u. Jagdztg.*, 116 (169–88). [*For. Abstr.* 3 (125).]
[54] „ (1940). *Deutsche Forstwirt, Berlin* 22 (33–5). [*For. Abstr.* 2 (210).]
[55] „ (1951). Beiträge zur Keimungsphysiologie der Forstpflanzen. Bayerischer Landwirtschaftsverlag, München.
[56] Schmidt, W. (1926). *Forstarchiv* 2 (2–9).
[57] „ (1929). *Z. Forst- u. Jagdw.* 61 (413–28).
[58] „ (1937). *Deutsche Forstwirt, Berlin* 19 (409–11; 421–4).
[59] „ (1938). *Deutsche Forstwirt, Berlin* 20 (125–7; 141–3; 149–53; 165–8).
[60] „ (1940). *Z. Forst- u. Jagdw.* 72 (35–47). [*For. Abstr.* 2 (36).]
[61] Šefer-Safonova, E. Ja. *et al.* (1934). *Bot. Ž.* 19 (566–94).
[62] „ and Šumilina, Z. K. (1937). *Trud. vsesojuz. nauč.-issled. Inst. Agrolesomel.* 10 (36–57).
[63] Suchecki, K. (1947). Hodowla lasu. 'Ex Libris', Warsaw.
[64] Tashiro, S. (1912). *International Congress of Applied Chemistry* 26 (163).
[65] Thunberg, T. (1920). *Skandinavisches Archiv für Physiologie, Berlin* 40 (1–91).
[66] Tirén, L. (1945). In *Skogsodling*. Svenska Skogsvårdsföreningens Förlag, Stockholm. pp. 45–66. [*For. Abstr.* 8 (No. 215).]
[67] „ (1948). *Medd. SkogsforsknInst., Stockh.* 37 (5). [*For. Abstr.* 11 (No. 244).]

8] TOUMEY, J. W., and KORSTIAN, C. F. (1942). Seeding and planting in the practice of forestry. John Wiley & Sons, Inc., New York. 3rd ed. [*For. Abstr.* 7 (No. 1164).]
9] ,, and STEVENS, C. L. (1928). *Bull. Yale Sch. For.* No. 21.
0] TSKHOIDZE [CHOIDZE], V. (1936). *Izvestija Batumskogo Subtropičeskogo Botaničeskogo Sada* 1 (91–6).
1] TURESSON, G. (1922). *Bot. Notiser* (323–35).
2] TURINA, B. (1922). *Biochemische Zeitschrift, Berlin* 129 (507–33).
3] TYSZKIEWICZ, S. (1938). *Forstwiss. Cbl.* 60 (725–58).
4] ,, (1949). *Podręczn. Inst. Bad. Leśn.* No. 2. [*For. Abstr.* 11 (No. 2656).]
5] ULLÉN, G. (1946). *Skogen* 33 (67–8). [*For. Abstr.* 7 (No. 1746).]
6] VERSEPUY, M. (1935). *Rev. Eaux For.* 73 (1099–105).
7] VILMORIN, J. DE, and CAZAUBON. (1922). *C.R. Acad. Sci., Paris* 175 (50–1).
8] VOÏČALJ, P. I. (1946). *Sbornik naučno-issledovateljskih rabot, Arhangeljskiĭ lesotehničeskiĭ Institut* No. 8 (77–83). [*For. Abstr.* 9 (No. 843).]
9] WACH, A. (1942). *Tharandt. forstl. Jb.*, 93 (143–93). [*For. Abstr.* 4 (102).]
0] ,, (1942). *Allg. Forst- u. Jagdztg.*, 118 (178–88; 210–8). [*For. Abstr.* 4 (164).]
1] WALLER, A. D. (1901). *Proc. roy. Soc. Lond.* 68 (79–92).
2] WIBECK, E. (1928). *Norrlands SkogsvFörb. Tidskr.* 1 (4–35).
3] WIEBECKE (1910). *Z. Forst- u. Jagdw.* 42 (342–60).
4] WŁOCZEWSKI, T. (1937). *Wydaw. pomocn. tech.-gosp.* (*Ser. B*) *Inst. Bad. Leśn.* No. 3.
5] ŻABKA, E. (1946). *Lesn. Práce* 25 (214–23).
6] ZEDERBAUER, E. (1906). *Cbl. ges. Forstw.* 32 (306–13).

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

0 (048.1). BIBLIOGRAPHICAL LISTS

See also Nos. 589, 599–600, 667.

1. SASAKI, T., and WATANABE, K. **Japanese forestry bibliography, 1940–48.** *Prelim. Stud. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 40, 1950. pp. 132.

0 (052/054). PERIODICALS

See also No. 713.

2. ***Sudan Silva.*** Sudan Forestry Society, Khartoum. Half-yearly. Price 30 *pias.*

Vol. 1, No. 2, issued Aug. 1949, contained 32 pages.

3. ***Canadian Journal of Research.*** National Research Council, Ottawa. P.R.

As from 1 Jan. 1951, Sections *A–F* of this become separate journals under the titles *Canadian Journal of Physics* (2-m., $2 p.a.), *Canadian Journal of Chemistry* (m., $3 p.a.), *Canadian Journal of Botany* (2-m., $2 p.a.), *Canadian Journal of Zoology* (2-m., $2 p.a.), *Canadian Journal of Medical Sciences* (2-m., $2 p.a.), and *Canadian Journal of Technology* (m., $3 p.a.). All are issued by the original publishers and begin at Vol. 29, in continuation of the original volume numbers. Abbreviations in *For. Abstr.: Canad. J. Phys., Canad. J. Chem., Canad. J. Bot., Canad. J. Zool., Canad. J. med. Sci.*, and *Canad. J. Technol.*

4. ***Pennsylvania Forests.*** Pennsylvania Forestry Association, Easton, Pa. Quarterly. Price $3 p.a.

From the winter issue 1951 (Vol. 36, No. 346) the journal formerly known as *Forest Leaves* will be called *Pennsylvania Forests.* Abbreviation in *For. Abstr.: Pa. For., Easton.*

5. ***The Garden Journal of the New York Botanical Garden.*** New York Botanical Garden, Bronx Park, New York 58, N.Y. Bi-monthly. Price $2 p.a.

A new journal replacing the *Journal of the New York Botanical Garden,* and, although different in style and format, retaining the chief features and policy of that periodical. Vol. 1, No. 1 is published for Jan.–Feb., 1951. Abbreviation in *For. Abstr.: Gdn. J. N.Y. bot. Gdn.*

0 - - 011. TERMINOLOGY, NOMENCLATURE

See also Nos. 611–2, 614–8, 620.

6. SASAKI, T., and WATANABE, K. **Glossary of Japanese forestry terms.** *Rep. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 131, 1950. pp. 132. 12 refs.

In two parts, English/Japanese (Hepburn romaji transliteration plus ideographs) and Japanese/English. The terms include words commonly used in forest literature, technical terms, and some non-forestry terms. Names of trees and plants are not included as these have been covered in other lists. [Cf. *For. Abstr.* 13 (Nos. 87, 97).]

7. PHILIPPIS, A. DE. **Riproduzione e rinnovazione, due termini spesso confusi.** [**Reproduction and regeneration, two terms often confused.**] *Ital. for. mont.* 6 (1), 1951 (41). [It.]

Discusses the use of these two terms and also gives the terms for different forms of cutting, layer etc.

0 - - 087. APPARATUS, INSTRUMENTS, MACHINERY: GENERAL

8. LEIJONHUFVUD, A. C. **Motorn i skogsbrukets tjänst.** [**The use of motor power in forestry.**] *Svenska SkogsvFören. Tidskr.* 47 (2), 1949 (93–114). [Sw.]

The uses of motor power in Sweden for transport, felling, soil working, and roadmaking are discussed and the need for further mechanization is urged. Figures for ditch digging show a cost of 8 Kr./m. for hand labour and 2·85 Kr./m. for mechanical excavation, a saving of 64%. In roadmaking, the use of tractors for breaking up the ground gave an estimated saving of 34%. Figures showing relative costs of transporting timber by wheeled or caterpillar tractor and by horse-drawn vehicles under different conditions are tabulated and show savings of 2·5 to 7·5 øre/cu. ft. when tractors are used. Tables are given showing the roads planned for a 10-year period in an area of 20,000 ha., covering: (1) tractor roads between 4·5 and 10 km. in length, of packed snow; (2) horse roads up to 5 km.; and (3) 'jeep' roads for transport of men and materials for forest work during the summer. The estimated costs are also shown. Figures showing the mechanical equipment used in Sweden for felling, transport, roadbuilding, ditching etc. during 1948, and estimated requirements for 1949–53, are tabulated. The value of requirements for the 5-year period is estimated at over 8 million Kr. The possibilities of central pools to hire out the larger machines (the smaller machines to be possessed by individuals) are considered, and the desirability of co-operation between agriculture, forestry and the army to encourage the production of standard vehicles and equipment suitable for all three purposes is discussed.

11. SITE FACTORS: CLIMATE, SITUATION, SOIL, HYDROLOGY (WATER AND SOIL CONSERVATION)

111. *The Atmosphere. Meteorology. Climate and Microclimate*

111.2. Radiation and Temperature

See also No. 135.

9. GYURKÓ, P. Az elemek által kibocsátott áthatoló sugárzás biológiai hatásáról. XI. Az ólom által kibocsátott áthatoló sugárzás fontosabb fizikai állandóinak meghatározása az önabszorpció útján. [**Researches on the biological effect of the penetrating rays of the elements. XI. The determination of the physical properties of the radiation of the element Pb by means of its own absorption.**] *Erdész. Kiséri.* 49 (1/4), 1949 (183–8). 5 refs. [Hu.e.] Cf. *For. Abstr.* 12 (No. 50).

111.8. Climatology. Climate and Microclimate

See also Nos. 51, 131, 135, 190, 222.

10. GEIGER, R. **The climate near the ground. A translation by M. N. Stewart and others of the 2nd German edition of *Das Klima der bodennahen Luftschicht* with revisions and enlargements by the author.** Harvard University Press, Cambridge, Mass. 1950. pp. xxi + 482. 821 + 160 refs. Price [32*s.* 6*d.*]

11. [**Studies of the microclimate in *Pinus radiata* stands.**] *Rep. For. Timb. Bur. Aust. 1949* [? 1950] (12).

The results of meteorological observations made over a number of years are briefly summarized. *Wind:* Cup-anemometer readings taken for 10 years outside and above a Pine plantation, showed that in open country 100 yd. from the plantation edge, the wind mileage steadily decreased with the growth of the trees in the plantation. *Rainfall:* The mean annual rainfall recorded above the plantation was 77%, and inside, 59%, of the mean annual rainfall outside the plantation. The % was found to vary considerably with individual rainstorms. In light rains, much less than 59% reached the forest floor, while in heavy rains, 90% or more was registered at times. *Air temperatures:* Differences in temperature were very small, but there appeared generally to be slightly milder temperatures (differences only of the order of ½°) under and above the crowns than outside. Minimum temperatures taken at different heights within the stand showed them to be slightly higher at the level where the crowns were densest than below or above that level. *Soil temperatures* were measured at depths of 6, 12, and 24 in., inside and outside a plantation. In terms of annual means, soil temperatures in the open were about 5° F. higher than in the plantation. The air (screen) temperatures were 4° lower than soil temperatures in the open and 1° higher than soil temperatures in the plantations. *Tree-trunk temperatures:* Thermometers were inserted radially 2½ in. into the trunks of trees, and the results show that the mean trunk temperature was 1·5° lower than the air temperature; mean minimum trunk temperature was *ca.* 6° higher, and mean maximum *ca.* 9° lower than air temperature. During winter, trunk temperatures sometimes fell slightly below the freezing point of water. [Cf. *For. Abstr.* 7 (No. 550).]

12. KONDA, K. **Low temperature observations in woodlands.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (105–23). 10 refs. [Jap.jap.]

An account of readings taken in the experimental forest area of Hokkaido University, 700 m. above sea level, at stations varying up to *ca.* 30 m. in altitude. A typical early-frost day (22.12.39) gave the following minimum temperatures at 0·25 m. above ground level: (1) Valley, grass—(*a*) light snow, −16·6° C., (*b*) 7 cm. snow, −14·0°. (2) Valley, under scattered adult Pine, −11·7°. (3) Hilltop, 28 m. above (1)—(*a*) with 2-m. Pine seedlings in short grass, −11·6°; (*b*) open, −10·8°.

Records for 295 days (July–April) on a clear-felled area suffering frequently from frost damage, showed that minimum temperatures at 0·25 and 1·0 m. above ground differed, at their maximum, by 8·4° in January and by 10·6° in February; differences for mean monthly minima (July–December) varied from 0·63 to 1·72°, those for January and February being the greatest.

13. VINCENT, G., ŠPALEK, V., and PŮLNAR, M. Příspěvek k rozdělení Čech a Moravy na lesní pěstební oblasti. [**Proposal for the division of Bohemia and Moravia into silvicultural regions.**] *Sborn. čsl. Akad. zeměd.* 23 (3/4), 1950 (185–92). 7 refs. [Cz.russ.f.] C.G.B.

The best single factor for distinguishing growth regions for Czechoslovakian tree species appears to be length of growing season, expressed as the period during which the mean daily temperature (averaged over as many years as possible) is constantly at least 10° C. Observations have shown that the principal areas over which the chief species occur naturally are correlated with length of growing season as follows: (*a*) *Picea abies*—130 days or less; on mountain massifs. (*b*) *Pinus sylvestris* and *Fagus sylvatica*—130–165 days; lower, more dissected mountainous areas. (*c*) *Quercus robur*—over 165 days; plains and hills. Using extensive meteorological data compiled by Gregor and Minař [given only in a summary table] the authors construct maps showing the boundaries of areas satisfying requirements (*a*)–(*c*) and subdivide these by geographical location into 6 growth regions:—(1) Mountain massifs of the frontier, including the Teplice and Doupov mountains (*a*). (2) Bohemian highlands (*b*). (3) Bohemian plain (*c*). (4) Moravian highlands (*b*). (5) Moravian lowlands (*c*). (6) The Beskid Mts. of Silesia (*a*).

14. CHRISTJANSEN, S. L. Klima og skovfrø. [**Climate and forest seed.**] *Dansk Skovforen. Tidsskr.* 35 (4), 1950 (185–92). [Dan.]

Stresses the need for closer consideration of local climates in interpreting the behaviour of tree species

in Denmark, whether raised from imported or from Danish-grown seed. Suggests that a useful climatic index might be found in the mean precipitation for the period June–Sept. divided by the mean temperature of that period. Tabulates values for this ratio at some Danish stations to support the author's impression that e.g. Silver Fir does best when this ratio is high, Scots Pine when it is low, and Norway Spruce in the middle of the range of values. Pleads for a competent study of the possibility of dividing the country into local climatic regions on some such basis and for the collection of similar data for regions from which seed of exotic species is imported, and points out the dangers of neglecting significant differences of local climate at any time when questions of provenance or breeding are concerned. [Cf. *For. Abstr.* 12 (No. 3496).]

15. TSCHERMAK, L. Klima und Wald in Italien und Griechenland. **[Climate and forest in Italy and Greece.]** *Wetter und Leben, Horn* 2 (7/8), 1949 (145–52). 15 refs. [G.] L.S.

Discusses the influence of climate on distribution, composition and regeneration.

16. TSCHERMAK, L. Klima und Wald in Anatolien. **[Climate and forest in Anatolia.]** *Wetter und Leben, Horn* 2 (1/2), 1949 (4–13). 15 refs. [G.] L.S.

Describes and discusses climatic regions and vegetation.

17. SMITH, J. **Distribution of tree species in the Sudan in relation to rainfall and soil texture.** *Bulletin, Ministry of Agriculture, Sudan Government* No. 4, 1949. pp. 66 + 7 maps, 9 dgms. & gphs. [E.] Price 40 *pias*.

Part I gives basic facts of geography, soils, and climate. Part II deals with forest geography. A system of distribution analysis by transects cut through rainfall zones and site types is recommended as likely to be of value in the Sudan and elsewhere, and the relative moisture values of different site types are assessed. Part III discusses the influence on forest geography, of the paramount soil and water factors; offers, for the fuller interpretation of the facts of distribution, the concepts of the climatic climax soil, of the datum soil, and of the clay/water-line or rainfall/soil-texture ratio, and concludes with instances of their practical application.

Many apparent anomalies of distribution or examples of great versatility of plants indicate that rainfall is not the sole controlling factor and critical analysis shows that such anomalies are explained not by plant versatility but by the controlling factors of rainfall and soil texture operating together.

18. PEARSON, G. A. **A comparison of the climate in four Ponderosa Pine regions.** *J. For.* 49 (4), 1951 (256–8). 2 refs.

In the regions studied (eastern California, eastern Oregon and Washington, the Black Hills of S. Dakota, and northern Arizona) differences in temperature are much less in both amount and seasonal distribution than differences in precipitation, but all regions can be described in general terms as cold and dry.

114. *Soil. Soil Science*

See also Nos. 17, 171.

19. EHRENBERG, P. Allgemeine und besondere Bodenkunde für den akademisch gebildeten Forstmann. **[General and special pedology for the academically educated forester.]** Verlag M. & H. Schaper, Hannover. 2nd ed. (rev.) 1949. pp. 163. [G.] Price *DM*8.

Intended as a guide for students and forest officers in Germany. Of the two main parts of the work the first (pp. 8–62) deals with the general pedology of Central Europe, and has sections on soil genesis, soil 'statics' (classification etc.) and 'dynamics' (structure, development and degradation of forest soil). The remainder (pp. 63–162) is devoted to the special pedology of Central Europe, with sections on: natural conditions for the existence of forest, significance of topography and of geological origin and petrographical features of the parent rock; physical, chemical and biological properties of forest soils; the influence of man; forest soil types; demands of individual tree species on the soil; injuries to and 'diseases' of forest soils; and fertilizing.

20. SÜCHTING, H. F. Kurzes Lehrbuch der Bodenkunde und Pflanzenernährung für Forstwirte und auch für Landwirte, Gärtner und Naturwissenschaftler. **[A short textbook of soil science and plant nutrition for the forester and also for the agriculturist, the gardener and the naturalist.]** Landbuchverlag G.M.B.H., Hannover. 1949. pp. xvi + 290. 119 refs. [G.] Price [18*s*. 6*d*.]

The elements of soil science (including biology), with a section on methods of improving the soil by draining, cultivating, fertilizing, liming etc.

21. **Fourth International Congress of Soil Science, Amsterdam 1950. Transactions: General and Sectional Papers.** Hoitsema Brothers, Groningen, Netherlands. Vols. 1 and 2 [1951?]. pp. 420 + 266 + 8 plates.

22. **Fourth International Congress of Soil Science, Amsterdam 1950. Transactions: Sectional papers, discussions, reports of the sessions and general information.** Hoitsema Brothers, Groningen, Netherlands. Vols. 3 and 4 [1951?]. pp. 176 + 244. Numerous refs.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 31–4, 138, 533.

23. CHENERY, E. M. **Some aspects of the aluminium cycle.** *J. Soil Sci.* 2 (1), 1951 (97–109). 15 refs. [Rothamsted Experimental Station.]

Data from soil profiles under proved Al-accumulating plants in the Caucasus, Trinidad, and Cumberland, are reviewed, and no evidence is found to prove that these plants could delay the process of podzolization, i.e. loss of sesquioxides by leaching. Amounts of Al uplifted and returned to the soil through such vegetation are very small, and are liable to be over-emphasized in analysis figures. The author concludes that Polynov's hypothesis, that the forests growing in the red soils of the Black

Sea prevent podzolization by uptake of sesquioxides, is untenable.

24. Coldwell, B. B., and DeLong, W. A. **Studies of the composition of deciduous forest tree leaves before and after partial decomposition.** *Sci. Agric.* 30 (11), 1950 (456–66). 36 refs. O.R.E.

The studies were undertaken in connexion with an investigation into the fundamental processes of podzol development and the part played by acid components leached by natural rainfall from decomposing leaves. Measurements of leaf fall from Maple (*Acer saccharum*), Beech (*Fagus grandifolia*), Birch (*Betula populifolia*) and Poplar (*Populus grandidentata* and *P. tremuloides*) gave the following results in annual weight (lb. dry matter) per acre: Maple 3,010, Beech 1,943, Birch 1,503, Poplar 1,489. For freshly fallen leaves, Maple had the highest ash and extractive content and the lowest lignin content. Beech had the lowest extractive content and the highest lignin and holocellulose content. Maple and Birch leaves, when exposed to weathering in trays, decomposed twice as fast as Beech, but the difference was not so marked in leaves lying on the soil. Extent of decomposition was related to leaf composition and moisture content. Ash extractives and α-cellulose were readily removed during decomposition. Lignin and hemicelluloses were relatively resistant. The species showed much variation. Natural rainwater leachates from Maple leaves were strongly acid, from Birch least acid, with Beech and Poplar intermediate [cf. *For. Abstr.* 13 (No. 61)]. In all cases the leachates became progressively more alkaline as the duration and extent of decomposition increased. *From authors' summary.*

25. Zonn, S. V. K voprosu ob èvoljucii buryh lesnyh počv na severnom Kavkaze. **[On the evolution of brown forest soils in the northern Caucasus.]** *Pedology* 1950 (6), (334–9). 11 refs. [Russ.] A.P.B.

Compares profiles, chemical properties and mechanical composition of a brown forest soil [Gulisashvili's 'burozems', cf. *For. Abstr.* 7 (No. 1578); 9 (No. 1429)] on two plots 50–70 m. apart:—(1) under Oak/Hornbeam forest with admixed Hazel and fruit trees, and (2) on arable land that had been under similar forest some 100–150 years before. Results, which are tabulated, indicate broadly that deforestation and agriculture cause a peculiar deflection of soil development towards the formation of degraded chernozems. It seems necessary to revise the opinion propagated by some authors, that the brown forest soils represent former chernozems degraded by an advance of the forest upon what was once steppe: the process is more likely to have been the reverse.

26. Gavrilov, K. A. Vlijanie različnyh lesnyh kuljtur na počvu. **[Influence of different forest crops on the soil.]** *Lesn. Hoz.* 3 (3), 1950 (30–5). [Russ.]

Gives a fuller account of the soil differences noted in a separate paper in which the same stands [see *For. Abstr.* 12 (No. 931]) are dealt with from the point of view of soil microbiology. Data on humus content, total bases, degree of base saturation, and pH, are given in graphs showing the distribution of these values at different levels in the profiles examined. The soil-improving role of Oak and Birch, particularly the former, and its significance, e.g. in choice of species and form of crop (pure or mixed), are discussed.

27. Kovrigin, S. A. K voprosu o počvah poimy lesnoï zony i povyšenii ih plodorodija. **[Floodplain soils of the forest zone and [means of] increasing their fertility.]** *Pedology* 1950 (6), (354–60). 8 refs. [Russ.] A.P.B.

Tabulates by horizons the mechanical composition and physical and chemical properties of floodplain soils under forest (Oak over 100 years old, alone or with younger understoreys of associated hardwoods) and adjacent meadowland with few or no trees, along the rivers Bolva, Resna and Snezhet (one forest and one meadow profile in each valley). Two types of alluvium, sandy and clayey according to speed of water flow in flood time, are represented, the latter being the more fertile. Results show *inter alia* that the upper horizons of forest profiles are invariably poorer in the coarser soil fractions and richer in colloids than those of the meadows, even where the latter are farther away from the bank than the former. It is concluded that the floodplain forests play an important part not only in preventing erosion but also in soil improvement, the retardation of flood water leaving and re-entering the river causing sedimentation of fine suspended particles and enriching the soil with a silt fraction saturated with Ca ions.

28. Glotova, T. V. K harakteristike organičeskogo veščestva lesnyh i stepnyh počv zaščitnoï lesnoï polosy Saratov-Astrahanj. **[Characteristics of the organic matter of forest and steppe soils of the Saratov-Astrakhan shelterbelt.]** *Pedology* 1950 (8), (456–65). 5 refs. [Russ.russ.] A.P.B.

The studies described were made in four 40- to 50-year-old blocks of coppice Oak with *Acer platanoides* on light, sandy, grey forest soils and a heavy, clay-loam, dark-grey forest soil, in mid-May, mid-June and mid-October 1949. Arable soils 250–300 m. from the woods were studied for comparison. Results, which are tabulated, showed that *ca.* 80–90% of the total humus of these soils consisted of humic and fulvic acids plus unhydrolysable residue. Humic acids predominated in all the soils, but the arable soils had a higher humic-acid content than those under forest, and the heavy dark-grey forest soil a higher content than the light, grey forest soil [cf. *For. Abstr.* 11 (No. 1598)]. The forest soils had a considerably higher 'humin' (unhydrolysable residue) content, and showed a more rapid decrease in humus content with increasing depth in the profile, than the field soils. Although their total humic-acid content was lower, they had a higher content of humic acids unstably associated with the mineral fraction of the soil, and of water-soluble organic matter. The annual litter-fall in the forests varied from 3·9 to 5·7 metric tons/ha., the heaviest fall and highest ash content being recorded on the heavy soil. Litter decomposition proceeded most vigorously during the first half of the growing season. Ammonification was rapid

throughout the growing season in both litter and soil. Nitrification was much less rapid.

29. Puri, G. S., and Gupta, A. C. **The ecology of humus in conifer forests of the Kulu Himalayas.** *Indian For.* 77 (1; 2), 1951 (55–63; 124–9). 18 refs.

Soil profiles on river alluvia from the Chir Pine, Blue Pine, and Blue Pine/Deodar communities, and on glacial moraines and alluvia from Spruce and Silver Fir communities, were studied from the Parbatti and Kulu valleys. The data show a significant correlation between organic matter, N and Ca content of the humus. Both N and CaO tend to increase with an increase in organic matter in these soils. The amounts of organic matter and N fall considerably in lower layers of the soil.

On the basis of pH, N, organic matter, and Ca, the soils studied have been classed into three categories of skeletal, brown earth and podzolized soils, each with a different forest community. The soil pH also shows a relationship with forest communities. Broadly speaking, Spruce and Silver Fir communities at higher altitudes are found on brown-earth soils of low pH, with high organic N and Ca content. The Blue Pine/Deodar and Deodar at medium altitudes are found on podzolized or old brown-earth profiles with medium pH values, low Ca, medium N and medium organic-matter content. The Chir Pine community found at lowest altitudes occupies skeletal soils with high pH, low organic matter, low N and medium Ca. The high amounts of N and organic matter in soils at higher altitudes is probably due to low temperature and high atmospheric humidity, conditions in which the decomposition of plant material in soils is inhibited. On the basis of C/N and CaO content of tree litter of conifer and broadleaved species growing in these forests, explanations have been given for differences in pH and Ca content of these soils. *From authors' summary.*

30. Wittich, W. Der Einfluss der Streunutzung auf den Boden (Untersuchungen an diluvialem Sandboden). [**The influence of litter removal on the soil. (Investigations on diluvial sandy soils).**] *Forstwiss. Cbl.* 70 (2), 1951 (65–92). 25 refs. [G.g.]

Litter removal has only a gradual effect on the humus content of mineral soils; even after 35 years there is no significant fall below the content of humus in soils with their litter intact. The replacement of lost humus depends upon the biological activity of the soil, and in very inactive soils 80 years of litter conservation may result in no appreciable increase of humus content.

Continual litter removal, however, induces rapid changes in the composition of the humus. There is an increase in its N content but a decrease in the rate of formation of available N, and a gradual decrease in the content of easily assimilable bases. The base saturation, however, is not lowered. The adsorption capacity of the inorganic fraction of the soil apparently also decreases. Under these circumstances, soils bereft of litter generally show a lower acidity than soils with litter intact, except when the latter possess a higher buffer capacity.

Litter removal considerably reduces the available P content of podzolic soils, whereas in brown earths there is often an increase, which is attributed to a decrease in the organic constituent of the mixed gel surrounding the mineral particles and a consequent change in the electrostatic equilibrium of the colloidal system of the soil.

The influence of litter removal on the moisture status of the soil is very variable. A decrease in moisture capacity and the lack of protective vegetation are often offset by the absence of a water-consuming vegetation. Under dry conditions, moisture is more easily absorbed by soils bereft of litter, because of the decrease in humus constituents; on the other hand the soil, being uncovered, has a greater tendency to dry out.

There is a marked decline in soil organisms, corresponding to the loss of humus energy sources, and a deterioration in soil structure results.

The whole process of soil impoverishment following litter removal is complex, the deficiency in N playing an important rôle. Possible methods for improving such soils are discussed.

114.4. Soil Classification. Soil Types

See Nos. 25, 29.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See Nos. 27, 30, 37, 93, 531 *et seq.*

114.6. Soil Biology

31. Schmidt, E. L., and Starkey, R. L. **Soil microorganisms and plant growth substances: transformations of certain B-vitamins in soil.** *Soil Sci.* 71 (3), 1951 (221–31). 11 refs.

The investigations consisted of a study of the water-soluble B-vitamins riboflavin and pantothenic acid in a number of agricultural and forest soils. Studies were also made of the fate of riboflavin and pantothenic acid when added to soil. Leaf residues of both hardwoods and conifers contained relatively large amounts of riboflavin which decreased as the residues decomposed, or when they were mixed with mineral soil. This suggests that the activity of micro-organisms plays a major part in determining the amounts of vitamin growth substances in soils. B-vitamin materials added to soils were readily destroyed by micro-organisms, pantothenic acid being even less persistent than riboflavin. When plant materials containing small amounts of vitamins were added to the soil, action of microbial populations resulted initially in marked increases of the vitamins, followed by a progressive decrease after the third day. Maximum riboflavin production occurred at the peak of microbial activity as measured by CO_2 evolution.

32. Franz, H. Bodenzoologie als Grundlage der Bodenpflege mit besonderer Berücksichtigung der Bodenfauna in den Ostalpen und im Donaubecken. [**Soil zoology as the basis of soil management, with special reference to the soil fauna of the E. Alps and the Danube basin.**] Akademie-Verlag, Berlin. 1950. pp. xi + 316. 123 refs. [G.]

Chaps. 1–6 (pp. 1–64) deal with general soil zoology, stressing ecological aspects and including

one chapter on research technique (illustrated by 15 photos). Chap. 7 (pp. 69–292) gives details of the soil-fauna communities of the E. Alps and the Pannonian region, grouped by vegetation types (montane forest types pp. 106–214). Chap. 8 discusses interrelationships between the biology and utilization of the soil. Numerous tabular comparisons and species lists are included.

33. KÜHNELT, W. Bodenbiologie—mit besonderer Berücksichtigung der Tierwelt. [**Soil biology—with special reference to soil fauna.**] Verlag Herold, Vienna. 1950. pp. 368 + 4 photos. Numerous refs. [G.]

A survey of the soil fauna, its ecology and its rôle in the decomposition of litter and the formation of soil.

34. BORNEBUSCH, C. H. **Soil fauna and its importance in soil-type formation.** *Trans. 4th int. Congr. Soil Sci. 1950* 1, [1951?] (173–84).

A general review of research and methods in this field with data from studies of Danish forest soils. [Cf. *For. Abstr.* 3 (p. 283).]

116. *Hydrology. Soil and Water Conservation and Erosion*

See also Nos. 11, 27, 231, 330, 862, 881.

35. **The San Dimas experimental forest, Glendora, California.** California Forest & Range Experiment Station, Berkeley, Calif. [1950]. pp. 15.

A brief account of the experimental lay-out, its equipment and objects; with an annotated bibliography of U.S. publications on various phases of watershed management research.

36. MÄGDEFRAU, K., and WUTZ, A. Die Wasserkapazität der Moos- und Flechtendecke des Waldes. [**The water capacity of moss and lichen cover in the forest.**] *Forstwiss. Cbl.* 70 (2), 1951 (103–17). 15 refs. [G.] [Botanisches Institut der Forstlichen Forschungsanstalt, München.]

Laboratory experiments were undertaken to determine the amounts of water taken up by various species of moss and lichen, and the time taken for the moisture to be given off again. The water capacity of different species varies considerably, and the water capacity/morphology relationship is discussed. Plots of 25 sq. m. were established in different types of forest having fairly uniform moss or lichen cover, and the amount of precipitation able to be taken up by the moss cover was calculated. It was estimated that the living layer of moss (air-dry at *ca.* 60% relative humidity) can absorb about 5 mm. precipitation. When calculated on a basis of all moss present on the forest floor (both dead and living) the figures are trebled. The water-absorbing capacity of the greatly reduced moss cover of cleared areas is only $\frac{1}{5}$–$\frac{1}{36}$ of that of the neighbouring forest. The influence of moss and lichen on the water régime of the forest and on soil conservation is discussed.

37. WASSINK, J. T. Kaligebrek bij diep overgestoven heidevelden. [**Potassium deficiency in heathland covered by deep deposits of wind-eroded material.**] *Ned. Boschb.-Tijdschr.* 23 (3), 1951 (65–7). [Du.]

Suggests an explanation of K deficiency in areas where deep layers of blown sand have covered former heathland. In soils liable to wind erosion, K is present in the form of potash feldspar and is readily leached from the upper horizons. Wind erosion first removes the K-deficient horizons above the pan and deposits them in deep drifts elsewhere. If the pan is damaged, erosion may continue below it. The pan itself may break down but will not get blown until further disintegration has taken place, by which time some of its mineral content will have leached out. The K-enriched pan detritus and/or the lower horizons containing a normal amount of K, will generally be found, when displaced by the wind, to accumulate on the mounds or in the hollows of the original eroded area, and relatively small amounts will reach the area where drifts formed of the upper horizons have accumulated. Analyses of soil from (1) a mound on an eroded area, (2) the upper 5 cm. of a drift 6–7 m. deep, and (3) the upper 4 cm. of a wind-scooped area, confirmed this explanation; (1) showed 14% and (2) and (3) only 8% potash feldspar. The difference is only slight, and practice shows that a single dressing of 300–400 kg. of 20% K salt per ha. will correct the deficiency.

38. FRANK, B., and NETBOY, A. **Water, land, and people.** Alfred A. Knopf, New York. 1950. pp. 331 + xi + 36 photos, 3 maps. Price $4.00 (£1. 8*s.* 0*d.*).

A discussion of water-conservation measures so far carried out in the U.S.A.

39. KRAEBEL, C. J. **Forestry and flood control in Japan.** *Prelim. Stud. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 39, 1950. pp. 29. 6 refs.

The problem of erosion is discussed, figures for flood damage are given in tables and graphs, and recommendations are made on co-ordination of flood control, watershed improvement, upstream control, research and training, and, more specifically, on restriction of clear felling, planting immediately after felling, improvements to roads and cableways to reduce log skidding on steep slopes, restrictions on the collection of litter, management of treeless grasslands, control of conversion of forest to grass, and cultural practices in cleared areas.

40. RIAZ, A. G., and HABIB KHAN, M. **The problem of flood control in West Pakistan.** *Pakistan J. For.* 1 (1), 1951 (31–6).

14. SYSTEMATIC ZOOLOGY

145.7. Insecta. Entomology

See also Nos. 455–507, 751–8.

41. BEIRNE, B. **The Canadian species of *Epiptera* (Homoptera: Achilidae).** *Canad. Ent.* 82 (9), 1950 (186–90). (*Contrib. Div. Ent. Dep. Agric. Can.* No. 2716). O.R.S.

Presents a key to and descriptions of the species, which are all associated with conifers.

42. HAGGETT, G. **The life history and habits of *Zeuzera pyrina* Linn. (*aesculi* Linn.) in Britain.** *Entomologist, London* 83 (1043), 1950 (73–81). 9 refs. O.R.S.

The life history and distribution are discussed and food plants are listed. The insect is not sufficiently common to be considered a serious forest pest in Great Britain.

43. WELLINGTON, W. G. **Variations in the silk-spinning and locomotor activities of larvae of the Spruce budworm, *Choristoneura fumiferana* (Clem.), at different rates of evaporation.** *Repr.* from *Transactions of the Royal Society of Canada, Ottawa* 44, *Sect.* 5, *Ser.* 3, June, 1950 (89–101). 12 refs.
Cf. *For. Abstr.* 11 (No. 1486).

44. MCGUFFIN, W. C. **Descriptions of larvae of forest insects: *Plagodis, Anagoga, Hyperetis* (Lepidoptera : Geometridae).** *Canad. Ent.* 82 (10), 1950 (205–10). 7 refs. O.R.S.

45. BORUSIEWICZ, A., and KAPUŚCIŃSKI, S. **Contribution to the knowledge of the dissemination of the genus *Carabus* Lin. (Carabidae, Coleoptera) in the Polish forests.** *C.R. Sci. math. nat. Acad. polon.* 1949 (10), (8–9). [E.] O.R.S.
Information on the distribution of 23 species was obtained from specimens of the imago collected mainly in Pine forests between 1945 and 1948.

46. MIKULSKI, J. ST. **The influence of some environmental factors upon the development of eggs of Alder leaf-beetle (*Agelastica alni* L., Col.).** *Zoologica Poloniae, Wroclaw* 4, 1940–1947 (1948), (33–54). Numerous refs. [E.pol.e.] [Jagellonian University, Krakow.] L.S.

47. ALLEN, A. A., and LLOYD, R. W. ***Pyrrhidium sanguineum* L. (Col., Cerambycidae) as a British species.** *Ent. mon. Mag.* 87 (1044), 1951 (157–8). 1 ref.
Records an instance of *Pyrrhidium sanguineum* breeding on Oak in Herefordshire.

48. NAKASHIMA, T. **The seasonal change in temperature preference of larvae of *Anomala rufocuprea* Motschulsky.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (93–104). 15 refs. [Jap.jap.e.]
The seasonal movements of the larvae in the soil were investigated. Experiments showed that the sensibility of the larvae to temperature varied with the season. Only 6·3% stayed at a soil level where the temperature exceeded 20° [C.] throughout the season. Nearly 80% of the summer larvae remained, almost inactive, in the low-temperature soil layer (below 6·5°). After late August, larvae congregated where temperatures were 10 to 15°. In late October they preferred the layer with temperatures from 10 to 13°. In spring full-grown larvae just before pupation preferred the 16 to 24° layer. In summer, if food plants were placed in the layer with temperature at *ca.* 30°, the larvae congregated there instead of the low-temperature layer. *From author's summary.*

49. COUTURIER, A., and HURPIN, B. **Résultats principaux des observations relatives au hanneton commun (*Melolontha melolontha*) dans la région de Dannemarie en 1950. [Main results of observations on *M. melolontha* in the Dannemarie region during 1950.]** *C.R. Acad. Agric. France* 37(4), 1951 (161–5). 5 refs. [F.] A.P.B.

A summary of biological observations with particular reference to flight habits and oviposition.

50. PRENTICE, R. **Population studies on the Balsam-Fir sawfly.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (1), 1951 (3).
In order to determine the value of the 'beating' method of sampling forest-insect populations, collections of *Neodiprion abietis* received in Winnipeg since 1941 were analysed. The analysis indicates that the beating method of sampling should reveal long-term infestation trends or cycles. It should also provide indices of defoliation or population density for stands or larger areas, but it appears to be definitely limited in value as a means of providing population indices for individual trees when infestations approach moderate density.

51. BROWN, G. S. **Hemlock sawfly.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (2).
Populations of Hemlock sawfly [*Neodiprion tsugae*] in British Columbia were found to be directly proportional to the relative humidity within the tree crown. Epidemic populations occurred only where Hemlock made up at least 50% of the stand and where the minimum average relative humidity within the crown did not fall below 50% for any 30-day period during the summer. Relative humidity was governed by stand composition, stand density, age, elevation, and exposure, and was shown to be of direct significance to egg laying, hatching, and the movement and survival of small larvae.

15. ANIMAL ECOLOGY (INCLUDING GAME AND FISH MANAGEMENT, HUNTING, SHOOTING AND FISHING)

See also Nos. 42–3, 46–51, 460–2.

52. KOWALSKI, K. **Investigations on the ecology of small forest mammals in the neighbourhood of Krakow.** *C.R. Sci. math. nat. Acad. polon.* 1949 (1/2), (19). [E.] O.R.S.
In investigations between 1946 and 1948, 16 species of Insectivora, Chiroptera and Rodentia were found. The rodent population slowly declined from 1946 to 1948. When the population was small, rodents were found only in parts of the forest offering the most favourable conditions; when it was large, they were found in all types of forest.

53. SHELFORD, V. E. **[I]. Fluctuation of non-forest animal populations in the upper Mississippi basin. [II]. Fluctuation of forest animal populations in east central Illinois.** *Ecol. Monogr.* 21 (2), 1951 (149–214). Many refs.
Data used in this study are drawn from population records for Trelease Woods, in Champaign County, Ill., from 1933 to 1947. Forest species are defined as the population of both vertebrates and invertebrates that breed in the woods and do not generally leave the area; non-forest species as those that breed in the forest edge or in fields and return to the woods for shelter or hibernation in autumn and winter. The populations of different groups show a series of peaks: non-forest invertebrates in 1934 and 1944, forest invertebrates in

1937 and 1945–7, and birds and mammals at intermediate dates. Correlations between physical phenomena (temperature, rainfall and ultra-violet intensity) are shown in a series of graphs and diagrams for different species and groups. On the whole, rainfall and ultra-violet intensity appear to have more influence than temperature, although some species show a close correlation between population size and temperature variations. The rainfall and temperature limits differ for forest and non-forest species, and the optimum ultra-violet intensity is greater for the former.

54. HOLLOWAY, J. T. **Deer and the forests of Western Southland.** *N.Z. J. For.* 6 (2), 1950 (123–37).

Problems arising out of the acclimatization of deer in the indigenous forests are discussed, with examples drawn from the forests of Western Southland. The complexity of the problems and the necessity to distinguish carefully between changes that occur in forest composition in different types of forest, in the same types of forest in different localities, and at varying levels of deer population, are stressed. In illustration, the effects of deer browsing on 6 distinct forest types are described, and the future of these types is forecast. A list is presented of major food plants in order of palatability, and the use of such lists in assessing effective deer populations and the effects of culling operations is indicated.

16. GENERAL BOTANY

160. *Plant Chemistry*

See also Nos. 23–4, 116, 638–51, 799, 804–9, 812–4, 817–8, 820–3, 825, 829–30.

55. NĚMEC, A. Biochemie lesních dřevin. Část všeobecná: Chemické složení orgánů lesních dřevin. **[The biochemistry of forest trees. General part: Chemical composition of organs.]** *Publikace Ministerstva Zemědělství RČS, Praha* No. 120, 1948. pp. 310. [Cz.]

A compendious account of the constituents of (chiefly N. temperate) tree species, giving data drawn from the author's original researches and from literature [authors' names cited, but no bibliography included]. The subject matter is arranged systematically, according to the compounds and groups of compounds concerned, in 3 main sections: (1) organic (pp. 5–171); (2) water (water content and consumption, with special reference to its rôle in translocation and metabolism) (pp. 172–7); (3) inorganic (pp. 178–282). Data are given separately, when possible, for the various organs and parts of the tree (foliage, buds, flowers, pollen, seeds, wood and bark). The section on inorganic constituents contains many data on variations in ash composition with factors such as soil, site, season and age. There are copious tables and indexes to Czech names of compounds, botanical and Czech names of species, and names of authors mentioned.

56. PLOUVIER, V. **Sur la présence de québrachitol chez les Elaeagnacées. Sa recherche dans quelques autres Myrtiflorae. [The presence of quebrachitol in the Elaeagnaceae. Examination for it in other Myrtiflorae.]** *C.R. Acad. Sci., Paris* 232 (12), 1951 (1239–41). [F.f.] O.R.S.

Quebrachitol was found in all the Elaeagnaceae (*Elaeagnus* spp., *Hippophaë rhamnoides*, *H. salicifolia*, and *Shepherdia argentea*) examined. Mannitol was isolated from *Punica granatum* and saccharose from various of the Myrtiflorae including *Eucalyptus globulus*. Unidentified organic crystalline substances were found in *Nyssa sylvatica* and *Davidia involucrata*.

57. PARIS, R. **Sur un nouveau flavanoside des fleurs de l' *Acacia floribunda* Willd. [A new flavanoside from the flowers of *A. floribunda*.]** *C.R. Acad. Sci., Paris* 231 (1), 1950 (72–3). 2 refs. [F.f.] O.R.S.

The name floribundoside is proposed.

58. LITVINOV, M. A., and MOISEEVA, E. N. **Antibiotik lenzitin. [Lenzitin, an antibiotic.]** *Priroda, Moskva* 40 (1), 1951 (60–2). 5 refs. [Russ.] A.P.B.

A pure culture of *Lenzites sepiaria* was found to be bactericidal to 15 out of 20 species of bacteria tested. From the culture medium in which the fungus had been grown a series of extracts were made with organic solvents and evaporated *in vacuo*; the dry residues were dissolved in EtOH and tested for their effect on *Staphylococcus aureus*. The benzol extractive caused most inhibition of bacterial growth, closely followed by the acetone and amyl-acetate extractives. From the alcoholic solution of the benzol extractive a pure crystalline substance, named lenzitin, was obtained by repeated rectystallization. Lenzitin forms fine colourless needles of m.p. 166–168° C., readily soluble in chloroform, benzol, dioxane, amyl acetate and acetone, and feebly so in EtOH, ether and water. It dissolves in alkalis on heating, with partial loss of its antibiotic effect. With $FeCl_3$ it gives a violet coloration. It is organic, containing halide groups, N and S, is not thermo-stable, and has a distinct irritant effect on the conjunctiva of the eye and the mucous membranes of nose and larynx.

59. LEHTONEN, J. **Erittävätkö sammalet antibioottisia aineita? [Do mosses excrete antibiotic substances?]** *Metsät. Aikak.* 1949 (12), (409–10). 13 refs. [Fi.e.]

A short note on preliminary results of research recently started at Helsinki University on this question. The effect of 29 species of mosses, including 4 forest species, on *Proteus vulgaris* and 3 species of *Bacillus* are tabulated.

60. KLÖPPING, H. L., and KERK, G. J. M. VAN DER. **Antifungal agents from the bark of *Populus candicans*.** *Nature, Lond.* 167 (4259), 1951 (996–7). 6 refs. [Institute for Organic Chemistry T.N.O., Utrecht.]

[Cf. *For. Abstr.* 12 (No. 1486).] More detailed study of the bark of *P. candicans* resulted in the isolation of two actively fungistatic substances, benzyl gentisate and another not identified but very similar to pentatriacontene-17.

161. *Physiology*

See also Nos. 11, 136–40, 160, 609, 825.

61. TAMM, C. O. **Removal of plant nutrients from tree crowns by rain.** *Physiol. Plant., Copenhagen*

4 (1), 1951 (184–8). 13 refs. [E.e.] [Forest Research Institute of Sweden, Experimentalfältet.]

The composition of rainwater samples collected beneath trees (*Pinus sylvestris, Picea abies, Quercus robur* and *Betula verrucosa*) during the autumn of 1950, was compared with samples collected in the open. Considerable amounts of Ca, K, and Na were found in water collected beneath trees, together with smaller amounts of P and N. Differences occurred in the water collected beneath different species, particularly under conifers on the one hand and broadleaved species on the other, but the conditions of the experiment do not permit conclusions to be drawn from these. The investigations are being continued. [Cf. *For. Abstr.* 13 (No. 24).]

62. HYGEN, G. **Studies in plant transpiration I.** *Physiol. Plant., Copenhagen* 4 (1), 1951 (57–183). 63 refs. [E.e.] [Botanical Laboratory, University of Oslo.]

Develops the practical and theoretical applications of a method of research into plant transpiration. A number of apparently healthy and normal individuals, representative of the population to be investigated, are selected, and in order to secure approximate physiological homogeneity the plants are given a suitable pre-treatment which aims at inducing water saturation and maximum stomatal aperture. Excised shoots of the selected individuals are allowed to transpire under constant and standardized external conditions for several hours, the course of the fresh-weight decline being registered by means of a torsion balance. Deviations from the prescribed standard conditions which may occur during the observation period, are registered and taken into account in subsequent reduction of the data. The test material used was *Vaccinium myrtillus.*

63. SATOO, T. **Factors affecting the change in rate of water absorption by shoots of *Cryptomeria japonica* exposed to artificial wind.** *J. Jap. For. Soc.* 30 (1/2), 1948 (26–32). 16 refs. [E.e.jap.]

Change in rate of water absorption by shoots of *C. japonica* exposed to wind was measured by potometer. The rate always increased when shoots were exposed to wind, but an adjustment period of about 5 min. was generally needed before a steady absorption rate was reached. The adjustment absorption rate might be (1) higher or (2) lower than the steady rate or (3) equal to it: (1) occurred most often when water content was low and absorption rate high in calm air, (2) when conditions were reversed, and (3) when they were intermediate between (1) and (2).

64. **Transpiration.** *Rep. For. Timb. Bur. Aust. 1949,* [? 1950] (12).

A series of transpiration experiments was carried out between 1930 and 1942 on Eucalypts and Pines. Results were expressed as the amount of water given up by the plant per unit of leaf surface per unit of time. The transpiration rate was found to vary greatly according to the time of day and with changes in meteorological conditions. Speaking generally, it can be said that Eucalypts transpire more water than Pines per unit of leaf surface, but these results have not been converted to a tree or stand basis. [Cf. *For. Abstr.* 12 (No. 1750).]

65. PISEK, A., and TRANQUILLINI, W. Transpiration und Wasserhaushalt der Fichte (*Picea excelsa*) bei zunehmender Luft- und Bodentrockenheit. [**Transpiration and water consumption of Spruce in increasingly dry atmospheric and soil conditions.**] *Physiol. Plant., Copenhagen* 4 (1), 1951 (1–27). 31 refs. [G.g.] [Botanisches Institut der Universität, Innsbruck.]

Cf. *For. Abstr.* 12 (No. 2662).

66. POLSTER, H. Die physiologischen Grundlagen der Stofferzeugung im Walde. Untersuchungen über Assimilation, Respiration und Transpiration unserer Hauptholzarten. [**The physiological basis of production in the forest. Investigations into assimilation, respiration and transpiration in our principal forest species.**] Bayerischer Landwirtschaftsverlag G.m.b.H., Munich. 1950. pp. 96. Numerous refs. [G.] Price [16*s.* 6*d.*].

A report on experiments made in 1938–9, in the Forstbotanischer Garten der Hochschule Tharandt, to investigate the relationship of matter assimilated by 7 hardwood and softwood species, to that given off by them and to the production of wood. [Cf. *For. Abstr.* 13 (Nos. 148, 155–8).]

164. *Morphology*

See also Nos. 95, 106, 601 *et seq.*

67. CAMEFORT, H. Variations phyllotaxiques chez les plantules de quelques espèces de Cyprès. [**Variations in phyllotaxy of seedlings of some Cypress species.**] *C.R. Acad. Sci., Paris* 232 (2), 1951 (174–6). [F.f.] O.R.S.

Variations in the number of leaves in a whorl, either above or below the number characteristic for the species, is explained by the presence of leaf-producing centres in the growing-point of the stem.

68. ALLARD, H. A. **The ratios of clockwise and counterclockwise spirality observed in the phyllotaxy of some wild plants.** *Castanea* 16 (1), 1951 (1–6). 10 refs.

The spirality of the plants studied, which included some woody species, appears to be a purely random phenomenon with no genetic control.

69. BOLLI, M. Ricerche anatomiche sulla origine degli ovoli dell'olivo. [**Anatomical studies on the origin of buds in the Olive.**] *Olearia, Roma* 3 (12), 1949 (892–900). 8 refs. [It.] L.S.

Cf. *For. Abstr.* 11 (No. 2546).

70. NOZERAN, R. Les rameaux courts reproducteurs de *Ginkgo biloba.* [**The short reproductive twigs of *Ginkgo biloba.***] *Recueil des Travaux de l'Institut botanique, Montpellier* Fasc. 4, 1949 (68–75). 11 refs. [F.]

71. NOZERAN, R. Les inflorescences de *Cephalotaxus:* comparaison avec les cônes androgynes de Pinacées. [**The inflorescences of *Cephalotaxus*: comparison with the androgynous cones of the Pinaceae.**] *Recueil des Travaux de l'Institut botanique, Montpellier* Fasc. 4, 1949 (58–64). 3 refs. [F.]

72. NOZERAN, R. Les cônes femelles des *Juniperus* et l'inflorescence mâle de *Cephalotaxus.*

[The female cones of *Juniperus* and the male inflorescence of *Cephalotaxus*.] *Recueil des Travaux de l'Institut botanique, Montpellier* Fasc. 4, 1949 (65–7). 1 ref. [F.]

73. Ščepotjev, F. L. Plody-bliznecy greckogo oreha. **[Twin fruits in *Juglans regia*.]** *Priroda, Moskva* 39 (11), 1950 (56–9). [Russ.] A.P.B.

165. *Phylogeny, Evolution. Heredity, Genetics and Breeding, Variation*

See also Nos. 106, 108, 118, 133, 182, 228, 329, 428, 430.

74. Kiellander, C. L. Forstgenetik und Forstpflanzenzüchtung in Schweden. **[Forest genetics and forest tree breeding in Sweden.]** *Z. Weltforstwirt.* 13 (10/12), 1950 (173–83). 38 refs. [G.]

An illustrated review.

75. Kanezawa, R. **A list of chromosome numbers in woody plants. 1. Gymnosperms.** *Bull. Tokyo Univ. For.* No. 34, 1944 (205–16). 96 refs. [E.]

Species with abnormal chromosome numbers are listed under family and genus. The information is drawn from world literature available to the author up to 1944.

76. Kiellander, C. L. **Polyploidy in *Picea abies*.** *Hereditas, Lund* 36 (4), 1950 (513–6). 9 refs. [E.] [Forest Tree Breeding Institute, Ekebo Källstorp.] O.R.S.

In 1946, 93 morphological aberrants were sorted out from 1,200,000 2-year-old Spruce seedlings. They consisted of 49 diploids with $2n = 24$, 1 triploid with $2n = 36$, 22 tetraploids with $2n = 48$, 3 mixoploids, and 18 whose chromosome numbers could not be determined. The natural tetraploids do not differ morphologically from colchicine-treated plants of the same age in which tetraploidy had been at least partially induced, and show the same slow growth. Measurements made in July, 1950, show that diploid plants are on an average more than 3 times the height of the tetraploids. The height of the single triploid lies within the same height range as the tetraploids. In *P. abies* the optimum chromosome number appears to be $2n = 24$, and when this is exceeded a considerable lowering of vitality results. This explains why polyploidy in Spruce has hitherto escaped notice. [Cf. *For. Abstr.* 9 (No. 1455).]

77. Poucques, M. L. de. Études caryologiques sur les Fagales. III. Le genre *Quercus*. **[Studies of cell nuclei in the Fagales. III. The genus *Quercus*.]** *Bulletin du Muséum National d'Histoire Naturelle, Paris* (*Ser.* 2) 21 (4), 1949 (482–6). 12 refs. [F.] L.S.

A study of 5 species of *Quercus* reveals, despite considerable external morphological differences, a marked cytological uniformity. [Cf. *For. Abstr.* 12 (No. 969).]

78. Atchison, E. **Studies in the Leguminosae. IV. Chromosome numbers and geographical relationships of miscellaneous Leguminosae.** *J. Elisha Mitchell sci. Soc.* 65 (1), 1949 (118–22). 10 refs. L.S.

79. Almeida, J. L. Ferreira de. Sobre a cariologia de *Ceratonia siliqua* L. **[Cytology of *C. siliqua*.]** *Agron. lusit.* 10 (4), 1948 (263–77+ photo). 29 refs. [Port.e.]

80. Claverie, P.-A. Les races landaises du pin maritime. **[The races of *Pinus pinaster* occurring in the landes of Gascony.]** *Sud-ouest, Bordeaux* 12 Dec.; 26 Dec., 1950 (4; 4). [F.]

81. Karschon, R. Untersuchungen über die physiologische Variabilität von Föhrenkeimlingen autochthoner Populationen. **[The physiological variability of Pine seedlings from native Swiss stands.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (205–44). 88 refs. [G.f.]

It has proved possible to determine approximately, from quite short experiments, the origin of *Pinus sylvestris* seed derived from native Swiss stands, by the speed of germination, the phototropism of the plantules, and the photoperiodic reaction of seedlings and 1-year-old plants. There are also significant differences in the drought resistance of seedlings of different origins. The present study established the existence of an ecocline for speed of germination and phototropism of plantules of native Swiss Pines of different altitudes, due to natural selection exercised by heat and snow pressure. The photoperiodic reaction of the Pines studied was not due to differences in latitude of the parent stands, since day length is almost the same over the whole of Switzerland; but diurnal and annual variations in temperature are of the first importance for the formation of altitudinal races. Since photoperiodism varies with temperature, the photoperiodic reactions observed are to be explained by the variability in the thermoperiodicity of the ecotypes. [Cf. *For. Abstr.* 12 (No. 2837).]

82. Karschon, R. Photopériodicité et thermopériodicité chez le pin sylvestre. **[Photoperiodism and thermoperiodism in Scots Pine.]** *Schweiz. Z. Forstw.* 102 (5/6), 1951 (268–75). 12 refs. [F.g.]

A recapitulation of the arguments and experiments reported in a previous paper. [Cf. preceding abstract.]

83. **Pine hybrids being tested in the Southeast.** *J. For.* 49 (3), 1951 (191).

At the Institute of Forest Genetics, Placerville, a cross of *Pinus monticola* and *P. strobus* shows definite signs of hybrid vigour. Seedlings now in their 3rd growing season are *ca.* 3 times as large as seedlings of the same age from either parent. Seed of this cross is now being planted in N. Carolina to see how it will do in the east. Various *Pinus echinata* × *P. taeda* hybrids of Virginia and North Carolina races are being tested in Georgia.

84. Righter, F. I., and Duffield, J. W. **Hybrids between Ponderosa and Apache Pine.** *J. For.* 49 (5), 1951 (345–9). 13 refs.

The first 6 years' growth of an artificially produced hybrid between *P. ponderosa* and *P. latifolia* has been compared with that of the commercially important parent, *P. ponderosa*. The hybrid rapidly develops a long taproot and then proceeds to outgrow *P. ponderosa* both in height and diameter. These features of the hybrid are discussed in relation to planting and forest management in the California Pine region. *Authors' summary.*

85. SANTOS, J. BRITO DOS. Segregação nos híbridos *Quercus cerris* × *suber*. [**Segregation in *Quercus cerris* × *suber* hybrids.**] *Publ. Serv. flor. aqüic. Portugal* 10 (2), 1943 (383–90). 2 refs. [Port.e.]

A considerable range of variation was found in width of bark and of cambium, number of leaf stomata, pubescence and shape of leaves, and radius of stem at a height of 0·1 m., in 14 twelve-year-old hybrids. The independent segregation of these characters opens up possibilities of selective breeding for greater cork production.

86. ŠČEPOTJEV, F. L. O metaksenijah u čërnogo oreha. [**Metaxenia in *Juglans nigra*.**] *Priroda, Moskva* 39 (11), 1950 (59–61). 6 refs. [Russ.] A.P.B.

Claims the occurrence of metaxenia, as evidenced by the intermediate form of the endocarp, in hybrid fruits derived from *J. nigra* ♀ pollinated by *J. regia* and *J. mandshurica*. The reciprocal crosses gave no evidence of metaxenia. Despite the greater ease of crossing between *J. nigra* and *J. mandshurica* (18·7% of the pollinations successful) than between *J. nigra* and *J. regia* (7·5%), the former showed only 2 cases of metaxenia out of 18 hybrid fruits, whereas the latter gave 7 cases out of 24 hybrid fruits.

166. *Economic Botany*

87. TAKEDA, H. **Systematic list of economic plants in Japan.** *Rep. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 121, 1949. pp. 83. 40 refs.

Lists over 1,000 species, including many trees and shrubs, giving Japanese, scientific and English names and an indication of commercial uses.

88. CHEVALIER, A. Les flores et specialement les plantes utiles de l'hémisphère austral et notamment l'Océanie. [**The flora, especially the useful plants, of the southern hemisphere, in particular of Oceania.**] *Rev. int. Bot. appl. Agric. trop.* 31 (339/340), 1951 (38–50). [F.] P.R.

Includes notes on the distribution and uses of indigenous fruit trees, wild and cultivated, medicinal and toxic plants, plants used for textiles, and timber trees.

89. PAPY, H. R. Les plantes utiles de Tahiti et des établissements français de l'Océanie. [**The useful plants of Tahiti and of French settlements in Oceania.**] *Rev. int. Bot. appl. Agric. trop.* 31 (339/340), 1951 (94–113). 16 refs. [F.] P.R.

Includes notes on trees yielding fruits, textiles, resins, and dyestuffs, and those used for decoration; on the uses of indigenous trees and shrubs; and on the success of tree species introduced by the Agricultural Service.

90. VIROT, R. Les plantes indigènes utiles de la Nouvelle-Caledonie. [**Useful indigenous plants of New Caledonia.**] *Rev. int. Bot. appl. Agric. trop.* 31 (339/340), 1951 (120–31). 7 refs. [F.] P.R.

Contains notes on the properties and uses of timbers, on fibrous plants, fruit trees, medicinal plants, tannin-bearing species, dyestuffs, resins and oils, and ornamental species.

17. SYSTEMATIC BOTANY

172.8. Eumycetes (True Fungi)

See also Nos. 412–45, 743–9.

91. PEARSON, A. A. **A key to the genera of the agarics and boleti.** Foray Committee of the British Mycological Society, London. [*n.d.*] pp. 32. P.R.

92. HEIM, R. Un mycologue dans la hêtraie australe. [**A mycologist in the *Nothofagus* forests of Australasia.**] *Rev. int. Bot. appl. Agric. trop.* 31 (339/340), 1951 (54–69). [F.] P.R.

An illustrated account of fungi found in Australia and New Zealand, with notes on their distribution in other parts of the southern hemisphere.

173.2. Bryophyta (Liverworts and Mosses)

93. BALABÁN, K. Stanovištní mechorosty. [**Site-indicating bryophytes.**] *Lesn. Průvod., Praha* No. 5 1949. pp. 26 + 24 plates. 15 refs. [Cz.] Price *Kčs.* 20.

A practical guide to 30 Czechoslovakian liverworts and mosses and the site conditions which they indicate, produced on the same lines as Watson's *Woodland Mosses*. [See *For. Abstr.* 9 (No. 790).]

174. *Spermatophyta, Seed-Plants in General. Floras and Check-Lists*

See also Nos. 171, 601–6.

94. FITSCHEN, J. Gehölzflora—ein Buch zum Bestimmen der in Deutschland und den angrenzenden Ländern wildwachsenden und angepflanzten Bäume und Sträucher. [**Woody flora—a handbook for the identification of wild and cultivated trees and shrubs growing in Germany and adjacent countries.**] Quelle and Meyer, Heidelberg. 1950. pp. 288. [G.] Price 11*s.* 6*d.*

95. HOFMAN, J. Plody a semena dřevin: klíč k určování dřevin podle plodů a semen. [**The fruits and seeds of trees and shrubs: key for the determination of [native and introduced] trees and shrubs [in Czechoslovakia] by their fruits and seeds.**] *Lesn. Průvod., Praha* No. 3, 1949. pp. 92 + 26 plates. 8 refs. [Cz.] Price *Kčs.*58.

96. SVOBODA, P. Listnáče v zimě. [**Deciduous trees and shrubs in winter.**] *Lesn. Průvod., Praha* No. 1, 1949. pp. 103 + 4 plates. 37 refs. [Cz.] Price *Kčs.*51.

Discusses characters useful for recognition and gives a winter key to native and introduced species in Czechoslovakia, with drawings of the shoots and, for the most important trees, photographs of the bark.

97. **Important trees of Japan.** *Rep. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 119, 1949. pp. 87 + 2 maps.

Lists 109 tree species systematically, giving scientific, Japanese, and English names, and uses, with maps showing the distribution of the major species.

98. LI, H.-L. **Families and genera of Formosan plants, 2. Key to dicotyledonous families.** *Quarterly Journal of the Taiwan Museum, Taipei* 3 (3), 1950 (124–36). [E.]

99. ZOHARY, M. **The arboreal flora of Israel and Transjordan and its ecological and phytogeographical significance.** *Inst. Pap. imp. For. Inst., Oxf.* No. 26, 1951. pp. 59 + 2 maps. 72 refs.

100. BARROSO, L. JOAQUIM. Chaves para a determinação de gêneros indígenas e exóticos das gimnospermas no Brasil. [**Keys for the identification of the native and exotic genera of the gymnosperms in Brazil.**] *Rodriguésia* 12 (24), 1949 (123–36). [Port.]

101. BARROSO, L. JOAQUIM. Chave para a determinação de gêneros indígenas e exóticos das monocotiledôneos no Brasil. [**Key for the identification of the native and exotic genera of the monocotyledons in Brazil.**] *Rodriguésia* 12 (24), 1949 (119–21). [Port.]

102. BARROSO, L. JOAQUIM. Chave para a determinação de gêneros indígenas e exóticos da família Lauraceae no Brasil. [**Key for the identification of native and exotic genera of the Lauraceae in Brazil.**] *Rodriguésia* 12 (24), 1949 (137–46).. 6 refs. [Port.]

103. HILDEBRAND, F. H. Verbeterde boomenlijst van Manado. [**Revised list of tree species from Manado.**] *Rapp. Bosbouwproefsta. Bogor* No. 44, 1951. pp. 53. [Jav.Du.E.] (*Serie Boomnamenlijsten* No. 27).

The list is in 2 parts arranged (1) by vernacular names and (2) by family, genus and species. The durability class of the wood is also indicated. [Cf. *For. Abstr.* 12 (No. 992).]

174.2. Gymnosperms

104. VASILJEV, V. N. Daljnevostočnye eli sekcii *Omorica* Willk. [**Far-Eastern Spruces of the section *Omorica*.**] *Bot. Ž. SSSR* 35 (5), 1950 (498–511). 27 refs. [Russ.] [Botaničeskii Institut im. V. L. Komarova Akademii Nauk SSSR, Leningrad.] P.R.

Recognizes, describes and discusses the following species: *Picea jezoensis*, *P. hondoensis*, *P. microsperma*, *P. komarovii* sp. nov. (with Latin diagnosis) and *P. ajanensis* (not synonymous with *P. jezoensis*). *P. kamtchatkensis* of Lacassagne is reduced to *P. ajanensis* forma. Each species is illustrated by a drawing, and natural ranges are shown in a sketch-map. Possible origins and phylogeny are also discussed.

105. FRANCO, J. DO AMARAL. ***Cedrus libanensis* et *Pseudotsuga menziesii*.** *Bol. Soc. broteriana* (*Ser. 2*) 24, 1950 (73–7). [Latin]

Claims that *Pseudotsuga taxifolia* (Poir.) Rehd. is invalid, the earliest valid specific name being *Abies menziesii* Mirb. (1825), and suggests the new combination *P. menziesii* (Mirb.) Franco. *Cedrus libanensis* Juss. ex Mirb. antedates *C. libani* G. Don. in Loud.

176.1. Dicotyledons

See also No. 133.

106. JENTYS-SZAFEROWA, J. **An analysis of the collective species *Betula alba* L. on the basis of measurements of leaves. I. Method of work. *Betula verrucosa* Ehrh. II. *Betula pubescens* Ehrh. *Betula tortuosa* Ledeb. *Betula carpatica* Waldst. et Kit.** *C.R. Sci. math. nat. Acad. polon.* 1949 (6/7), (7–8); 1950 (1/3), (7–8). [E.] O.R.S.

Results for all species are based on leaves from vegetative dwarf shoots, as being the least variable. For *B. verrucosa*, samples from Poland and neighbouring countries were used, and compared with samples representing the species' European range: analysis showed: (1) a small local variation in leaf size, and a rather larger variation in shape; (2) a correlation between the angle of the base and the position of the broadest part of the lamina; (3) considerable variation in the lower part of the blade, ranging from leaves with an acute base and the broadest part in the middle of the leaf to those with a heart-shaped base and the broadest part near the base. For *B. pubescens:* (1) while the leaves do not differ from those of *B. verrucosa* by any single feature of shape, the relationship of the characters is different, giving a distinct structural plan; (2) the petioles are on average shorter than those of *B. verrucosa* and great variability exists in the petiole/leaf-length ratio; (3) the widest part of the leaf is normally in the middle of the blade; (4) great local variation exists in leaf size, and entire local aggregations are large- or small-leaved; (5) there is no distinct correlation between blade base and other characters. For *B. tortuosa* samples were collected between the Arctic circle and the northern limit in Finland and Scandinavia. The leaves were of similar average shape and variation in shape in all samples examined. They differed from *B. pubescens* in having a smaller number of pairs of lateral nerves, an acute angle of the second nerve, and a more obtuse apex. In these characters, they approach more closely to *B. nana*. For *B. carpatica*, material was obtained from the upper forest limit of various European mountains. The leaves were similar to *B. tortuosa* except that the position of the widest part of the blade is lower when the base angle is larger. There is considerable local variation in the base angle and the position of the widest part.

107. JOHNSTON, I. M. **Studies in the Boraginaceae. XX. Representatives of three subfamilies in Eastern Asia.** *J. Arnold Arbor.* 32 (1; 2), 1951 (1–26; 99–122).

An account of the Cordioideae, Ehretioideae and Heliotropioideae from China, northern Indo-China, Hainan, Formosa, Ryukyus and Japan.

108. HAYES, S. F., KEENAN, J., and COWAN, J. M. **A survey of the anatomy of the *Rhododendron* leaf in relation to the taxonomy of the genus.** *Notes R. bot. Gdn. Edinb.* 21 (1), 1951 (1–34 + 11 plates).

Anatomical leaf characters having a diagnostic value are: (1) the number of cell layers in the dermal layer, (2) the relative cell size of a multiple epidermis, (3) the thickness of the cuticle, (4) the presence or absence of water tissue, and (5) the presence or absence of epidermal papillae. In a primary subdivision of the genus, arrangement according to these criteria follows a new and independent line. In a secondary sub-division the criteria alone are rarely significant. At the level of the species, distinctions are seldom diagnostic. *From authors' summary.*

109. CAMUS, A. Le genre *Nothofagus*, hêtres de l'hémisphère austral. [**The genus *Nothofagus*, Beeches of the southern hemisphere.**] *Rev. int. Bot. appl. Agric. trop.* 31 (339/340), 1951 (71–80, 82, 84). 8 refs. [F.] P.R.

Includes a description of the characteristics of the genus, with the characters that distinguish it from *Fagus*, a key to the principal species, descriptions of the species and hybrids of South America, New Zealand, Tasmania and Australia, and notes on certain species introduced into Europe and N. America.

110. BLAKECLOCK, R. A. **The Rustam herbarium, Iraq. Part IV.** *Kew Bull.* 1950 (3), (441–60).

Includes descriptions of some species of *Quercus* with a key to the *Quercus* species found in Iraq.

111. KADAMBI, K. ***Dalbergia sissoides* Grahm.** *Indian For.* 75 (5), 1949 (1951) (168–74 + 2 plates). 18 refs.

Taxonomy, distribution, identification, silvicultural characters and wood properties.

112. AMSHOFF, G. J. H. **Notes on Guiana Myrtaceae. III.** *Rec. Trav. bot. néerland.* 42, 1950 (1–27). [E.] O.B.D.

Includes descriptions of several new tree species.

113. WHITE, C. T. **Some noteworthy Myrtaceae from the Moluccas, New Guinea, and the Solomon Islands.** *J. Arnold Arbor.* 32 (2), 1951 (139–49 + 1 plate).

Includes a description of a new genus, *Eucalyptopsis*, with one species *E. papuana*. Outstanding features of the new genus are, (1) the *Eucalyptus*-like leaves, (2) the articulation of the calyx tube immediately above the ovary, (3) the irregular disrupting of the calyx tube at its apex into lobes as far as the very highly placed staminal disk, and (4) the attachment of the stamens in 4 groups high up in the calyx tube, from which they are suspended in the bud stage. The absence of an intramarginal vein in the leaf of *Eucalyptopsis* is a feature distinguishing it from *Eucalyptus*. The genus with most affinity to *Eucalyptopsis* is probably the New Caledonian *Pleurocalyptus*. [Cf. *For. Abstr.* 13 (No. 605).]

114. JONES, G. N. **American species of *Amelanchier*.** *Illinois biol. Monogr.* 20 (2), 1946. pp. 126. Price $1.50.

115. CUATRECASAS, J. *Borojoa*, un nuevo género de Rubiáceas. [***Borojoa*, a new genus of the Rubiaceae.**] *Revista de la Academia Colombiana de Ciencias Exactas, Fisicas y Naturales, Bogotá* 7 (28), 1950 (474–7 + 1 plate). [Span.] C.G.B.

A new genus, the type species of which, *B. patinoi*, was found in the Río Calima Valley, Colombia.

116. MANUEL PATIÑO, V. Noticia sobre el borojo, una nueva especie frutal de la costa Colombiana del Pacifico. [**Notes on *Borojoa patinoi*, a new fruit tree of the Colombian Pacific coast.**] *Revista de la Academia Colombiana de Ciencias Exactas, Fisicas y Naturales, Bogotá* 7 (28), 1950 (478–81). [Span.] C.G.B.

Distribution and habitat of the tree and notes (with chemical analysis) on the edible fruit.

117. RIZZINI, C. T., and OCCHIONI, P. **'Dialypetalanthaceae'.** *Lilloa* 17, 1949 (243–86 + 20 photos). 27 refs. [Port.e.] L.S.

Presents a new monotypic family, Dialypetalanthaceae (order Myrtales), based on *Dialypetalanthus fuscescens*, formerly included among the Rubiaceae. A histological, anatomical and chemical study of *D. fuscescens* is presented.

118. HESMER, H. [Editor]. Das Pappelbuch. [**The Poplar manual.**] Verlag des Deutschen Pappelvereins, Bonn. 1951. pp. xii + 304. 10 pp. of refs. [G.] Price *DM*14.50.

A comprehensive and abundantly illustrated manual for growers and users, especially of the hybrid Black Poplars, containing contributions by experts (*H. Hesmer, R. Müller, W. Wittich, H. Müller-Thomas, F. Schwerdtfeger, K. Blume, H. Mayer-Wegelin* and *G. Jayme*) on: The general dendrology of the genus, including keys to and descriptions of all the important species and hybrids (with photographs of herbarium specimens), and discussions of breeding prospects and measures for maintaining quality by clonal control (pp. 1–61). Propagation (pp. 62–97). Poplar sites—climatic and soil requirements, soil improvement for Poplar growing (pp. 98–110). Establishment of plantations (pp. 111–41). Thinning and pruning (pp. 142–54). Injuries and protection (pp. 155–86). Yield (pp. 187–99). Felling and initial conversion (pp. 200–21). Properties and uses of the wood (pp. 222–36) [cf. *For. Abstr.* 13 (No. 631)]. Poplar as a pulpwood (pp. 237–43). Economic importance of Poplar growing (pp. 244–9). Poplar growing in the open countryside and its place in land use (pp. 250–63). Monthly calendar of Poplar work (pp. 264–8). Statutes of the Deutscher Pappelverein on the certification of planting stock (pp. 269–77).

There is a 10-page bibliography, classified by subjects, and full indexes are provided to species and subjects discussed in the text.

119. GUINIER, P. Les peupliers. [**Poplars.**] *Repr.* from *Bulletin de la Société de Botanique du Nord de la France, Lille* 2 (2), 1949 (54–64). [F.]

Classification, ecology, enemies and cultivation.

120. KOBUSKI, C. E. **Studies in the Theaceae. XXI. The species of Theaceae indigenous to the United States. XXII. Some new species of Theaceae in South America.** *J. Arnold Arbor.* 32 (2), 1951 (123–38; 152–4).

121. MERRILL, E. D. **Notes on *Elaeocarpus* Linnaeus.** *J. Arnold Arbor.* 32 (2), 1951 (157–200).

An attempt to synthesize the work of various individuals with that done by Knuth during the war of 1939–45.

18. PLANT ECOLOGY

See also Nos. 99, 180–1, 881.

181. *Mode of Life, Autecology. Silvicultural Characters of Trees*

See also Nos. 111, 118–9, 161, 190, 207–8, 216, 218, 808.

122. PELTON, J. F. **Outline for ecological life history studies in trees, shrubs, and stem succulents.** *Ecology* 32 (2), 1951 (334–43). Numerous refs.

123. AUGHANBAUGH, J. E. **The Tuliptree: gentleman of the forest.** *Pa. For. Wat.* 3 (1), 1951 (14–7, 23–4). 7 refs.

Silvicultural characters of *Liriodendron tulipifera.*

124. RAM, [B.] S. **Note on *Broussonetia papyrifera* (Paper Mulberry).** *E. Punjab For. Notes* 1948. pp. 7.

Its silviculture, growth rate and places of introduction in India.

181.1. Distribution, Natural Range

See also Nos. 116, 235.

125. SURBER, E. Die Winterlinde, *Tilia cordata* Mill. (*T. parvifolia* Ehrh.). Die Sommerlinde, *Tilia platyphyllos.* Scop. (*T. grandifolia* Ehrh.). [***T. cordata* and *T. platyphyllos*.**] *Schweiz. Z. Forstw.* 102 (4), 1951 (248–56). [G.F.]

Silvicultural characters and treatment.

126. PHILIPPIS, A. DE. Un notevole centro di vegetazione dell' abete bianco sui monti de Salernitano. [**A notable occurrence of *Abies alba* in the mountains of the Salerno region.**] *Repr.* from *Nuovo G. bot. ital.* (*n.s.*) 56 (4), 1949 (656–8). [It.]

127. POOLE, A. L. **The distribution of Toatoa [*Phyllocladus glaucus.*]** *N.Z. J. For.* 6 (2), 1950 (145).

128. REICHLING, L. Le pin d'Alep (*Pinus halepensis* Mill.) est-il spontané dans la région montpelliéraine? [**Is *P. halepensis* native to the Montpellier region?**] *Recueil des Travaux de l'Institut botanique, Montpellier* Fasc. 4, 1949 (76–81). 9 refs. [F.]

The question is left open, but the occurrence of this species at Pic St.-Loup (Hérault) in the 16th century is established.

129. NUNES, J. ROSADO. Notas acêrca da regeneração natural do pinheiro bravo na Serra da Estrêla. [**Notes on natural regeneration of *Pinus pinaster* in the Sierra d'Estrella.**] *Publ. Serv. flor. aqüic. Portugal* 10 (2), 1943 (297–301). [Port.e.]

Observations in the Valhelhas and Manteigas forests showed that natural regeneration of *P. pinaster* depends upon altitude. From 1,150 m. the number of trees diminishes, until at 1,200 m. they disappear. At 1,150 m. natural regeneration is scarce, and no pure stands are found. At 1,100 m. Pine is more frequent, but always in mixture. At 750 m. it forms pure stands, provided that good seed-bearers are present.

130. STORY, R. **New distribution records for *Ocotea bullata* E. Mey. and *Lachnopylis floribunda* (Bth.) C. A. Sm. with an account of an insect pest of the Stinkwood.** *S. Afr. J. Sci.* 47 (7), 1951 (190–8). 20 refs. A.P.B.

Describes a stand of *Ocotea bullata* growing at a density of about 16 trees to the acre, in mixture with a large number of other species in a valley in Albany. *O. bullata* is found in the moister part of the forest, mainly in the stream bed and on the banks. Coppice shoots were rising from many decayed stumps. The general aspect of the stand suggests that *O. bullata* will grow in this district only in a moist type of forest. The extent of decay and the small size of the trees, however, suggest that the habitat is not altogether favourable. A heavy infestation of the leaves by an unidentified psyllid is described in detail. *Lachnopylis floribunda* also was found in a secluded valley in Albany, where it grows mixed with other species but dominates the forest and attains a good size.

131. SŁAWIŃSKI, W. Granice zasięgu buka na wschodzie Europy (analiza fenomenu). [**The boundaries of the Beech in eastern Europe (an analysis of the phenomenon).**] *Ann. Univ. M. Curie-Skłodowska, Lublin* (*Ser. E*) 2 (4), 1947 (57–68). 68 refs. [Pol.e.] L.S.

At their eastern limit, Beech forests are found on good soils on high ground exposed to moist westerly winds, and on valley slopes. The gradual decline of the Beech, particularly marked in the second half of the 19th century, is due primarily to human activity, by felling, control of rivers, drainage etc. Plant diseases and changes in climate are secondary features. Figures for a 2- or 3-year period showing the number of days per vegetative period and per year with maximum day temperatures of 6·5 and 7° C. and average temperatures of 5° C. are tabulated, for 3 stations to the north and east of the limit for Beech. *From author's summary.* [Cf. *For. Abstr.* 10 (No. 937); 13 (Nos. 13–4).]

132. POOLE, A. L. **A pocket of Silver Beech—West Taupo.** *N.Z.J. For.* 6 (2), 1950 (144–5).

Describes an isolated stand of *Nothofagus menziesii* outside its usual range, and apparently a relict formation being rapidly invaded by Podocarps.

133. DUNCAN, W. H. ***Quercus oglethorpensis* —range extensions and phylogenetic relationships.** *Lloydia* 13 (4), 1950 (243–8). P.R.

A general survey of the range of *Q. oglethorpensis* in Georgia and S. Carolina, providing evidence for a fairly clear evolutionary picture. It seems that this Oak is a relic. A phylogenetic tree for this species and seven related Oaks is presented. *From author's summary.*

134. PERRIER DE LA BATHIE, H. Distribution et écologie du *Gossypioides brevilanatum* (Hochr.) Hutchinson de Madagascar. [**Distribution and ecology of *G. brevilanatum* in Madagascar.**] *Rev. int. Bot. appl. Agric. trop.* 31 (341/342), 1951 (231–2). [F.] P.R.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 13–8, 81–2, 158, 199 *et seq.*

135. ROUSSEL, L. Petite histoire de la photologie forestière. [**A short history of the study of light relations in forestry.**] *Bull. Soc. for. Franche-Comté* 25 (17), 1951 (726–33). 12 refs. [F.]

136. WAREING, P. F. **Growth studies in woody species III. Further photoperiodic effects in *Pinus silvestris.*** *Physiol. Plant., Copenhagen* 4 (1), 1951 (41–56). 33 refs. [E.e.] [**Department of Botany, Manchester University.**]

In these experiments, made with 1-year *P. sylvestris* seedlings, it was shown that cambial activity is maintained longer under 15-hr. than under 10-hr. photoperiods and that it can be prolonged in the autumn if the natural photoperiods are supplemented by artificial illumination to give a 15-hr. photoperiod. Hence, natural changes in day-length in the autumn appear to control the duration of cambial activity in *P. sylvestris*. The initiation of cambial activity in the spring occurs with both long and short days, provided that the new annual shoot is allowed to develop, but in debudded plants there is no cambial activity under either long or short days. The breaking of dormancy in *P. sylvestris* plants in the spring is hastened by a previous exposure to cool temperatures. Premature breaking of dormancy during the summer may be induced by exposing the plants to continuous illumination; the critical photoperiod for this effect appears to be *ca.* 20 hr.

The mechanism of photoperiodism in *P. sylvestris* is discussed, and the hypothesis is put forward that these effects result from the production of auxin (or an auxin-precursor) in the light, and the formation of an inhibitor in the dark. [Cf. *For. Abstr.* 12 (No. 2837).] *From author's summary.*

137. Veen, R. van der. **Influence of daylength on the dormancy of some species of the genus *Populus*.** *Physiol. Plant., Copenhagen* 4 (1), 1951 (35–40). 2 refs. [E.] [Philips Research Laboratories, Eindhoven, Netherlands.]

Describes briefly the small 'light cabinets' (illustrated) designed at the Philips Research Laboratories, in which plants can be grown under purely artificial light, and in which the reactions to illumination (day length, intensity, spectral light etc.) can be properly studied. The light, obtained from fluorescent tubes ('white' type), illuminates the plants from both sides and from above. In the experiments described, 1-year cuttings of *Populus alba, P. robusta, P. marilandica, P. tremula, P. trichocarpa* and seedlings of *P. nigra* and *P. lasiocarpa* were put into 5 different cabinets in March and exposed to different temperatures (14–30° C.) and day lengths (9 hr. to continuous). All plants at first showed vigorous growth, but after 4–6 weeks those being given short-day illumination (9–12 hr.) stopped growing and formed a dormant bud at the tip of all shoots. All plants given long days (16 hr. +) kept growing well, especially those with continuous illumination. After 3 months, all plants except those of *P. robusta* were exposed to 5° C. and a day-length of 9 hr. All growth was inhibited at this low temperature and after a few weeks the plants taken out of the short-day cabinets began to shed their leaves, whereas those from the long-day cabinets retained theirs even after 3 months of this artificial winter.

The plants of *P. robusta* remained during this time in their old cabinets and had their usual day-lengths and temperatures. After 8 months of growth the plants in the long-day cabinets were still developing new leaves at the same rate and had kept all their leaves since March; by this time they were so large that they had to be removed from the cabinets. In the short-day cabinets, however, the plants stopped growth in April and had lost all their leaves by the end of July, though they had never been subjected to lower temperatures. This dormancy was complete and was not broken by high temperatures as long as the short day lasted. When, however, the plants were exposed to continuous illumination, within a few months the buds swelled and developed into weak shoots with short internodes. Attempts were also made to break this dormancy by using ethylene chlorhydrine in short day. The buds that were revived in this way made 3–4 new leaves and went into dormancy again, the new leaves being shed in about 2 months.

The plants that had been exposed to an artificial winter for 3 months were then replaced in their original cabinets. Those in long day and continuous light immediately resumed the development of new leaves, so evidently no dormancy had been induced by 3 months of short days at 5° C. The short-day plants and some difficulty in waking even when they were exposed to long days.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 17, 23–30, 161, 194.

138. Bykova, L. N. Metodika raboty po izučeniju krugovorota azota i zoljnyh èlementov v lesnyh nasaždenijah. **[Method of work in studying the turnover of nitrogen and ash elements in forest stands.]** *Pedology* 1951 (1), (59–64). 10 refs. [Russ.] A.P.B.

Stresses the need for further, and more precise, data on the nutrient relations of forest tree species and stands, and especially the need for getting comparable values by a standard procedure. Gives details of such a procedure tried by the author [no results given], covering:—Selection of sample plots and size of plots appropriate to the various age classes. Selection of sample tree(s), weighing of stemwood, branches and foliage, and sampling for later chemical analysis. Collection, weighing and sampling of roots of sample trees, with simultaneous recording of soil profile and taking of soil samples. Weighing and sampling of herbaceous and moss layers from quadrats within the sample plots. Weekly collection, handling and storage of litter fall for subsequent analysis. Notes on calculations from the data obtained.

139. Shibamoto, T., Takahara, S., and Kawana, A. **Studies on water-culture of tree-seedlings (III and IV). Effect of reaction of nutrient solution on growth of some tree-seedlings (1 and 2)** *Bull. Tokyo Univ. For.* No. 38, 1950 (59–93). 4 refs. [Jap.e.]

Seedlings of *Cryptomeria japonica, Pinus densiflora, Cinnamomum camphora* and *Zelkova serrata*, were grown in nutrient culture solutions at different pH values over the range 3–8 with NH_4 and NO_3 as alternative sources of N. Changes in pH during growth were limited to within 1 pH unit by frequent renewal of the solutions.

Results	*Best pH*	*Poorest pH*	*Fatal pH*
C. japonica NO_3-N	5	7–8	—
NH_4-N	4	6–8	3
P. densiflora NO_3-N, NH_4-N	4	6–8	—
C. camphora NO_3-N	5	7–8	—
NH_4-N	4	3 and 8	6–7
Z. serrata NO_3-N	6	7–8	3

These results indicate that the optimum pH for seedling growth varies according to the source of N, the optimum being rather higher with NO_3-N than with NH_4-N. The seedlings showed a greater tolerance towards acidity and therefore grew over a wider range of pH on the NO_3-N cultures.

The form of N made little difference to the growth of *P. densiflora*, but, at the optimum pH, *Cryptomeria* and *Cinnamomum* made better growth with NO_3-N.

140. POEL, L. W. **Soil aeration in relation to *Pteridium aquilinum* (L.) Kuhn.** *J. Ecol.* 39 (1), 1951 (182–91). 22 refs.

Cf. *For. Abstr.* 10 (No. 901).

141. SANTOS, N. FERREIRA DOS. Natureza dos nódulos do *Podocarpus variegatus* Hort. [**Nature of the nodules on *P. variegatus***.] *Rev. agron., Lisboa* 36 (1/4), 1948 (68–73 + 5 photos). [Port. port.e.] A.P.B.

The root nodules were traced to an unidentified endotrophic mycorrhiza, very similar to that associated with *Sequoia sempervirens*.

142. RAHTEENKO, I. N. Vlijanie smešenija drevesnyh i kustarnikovyh porod na razvitie ih kornevoï sistemy. [**The influence of growing woody species in mixture upon the development of their root systems.**] *Lesn. Hoz.* 3 (4), 1950 (32–40). [Russ.]

In 1946 the All-Union Forestry Research Institute (VNIILH) planted trial plots of Spruce, Spruce/Pine, Pine, Spruce/Birch, Birch, Pine/*Caragana arborescens*, *C. arborescens*, Oak, Oak/Larch, Larch, Larch/Lime, and Lime, at the Ivanteevsk nursery, Moscow Province. The spacing was 25 cm. between and 20 cm. in the rows. All mixtures contained 50% of each species, arranged in a chequerboard pattern. In autumn 1948, when 4 years old, the plants were severed from their roots at ground level and weighed, and the root systems were then excavated and weighed, taking the pure plots first in order to get an idea of the rooting habits of each species before tackling the mixtures. Results are tabulated and illustrated by diagrams and graphs. The bulk of the roots (80–90% based on oven-dry weight of all species, whether pure or mixed) were concentrated in the A_2 horizon (top 20 cm.) of the soil—a podzolic clay-loam—and roots were densely ramified in this layer. Within this horizon, the upper 10 cm. contained 3–5 times the weight of roots found in its lower 10 cm. Root systems of the various species penetrated deeper in the mixtures than in the pure plots. Roots of deciduous species went deeper than those of the conifers, which in the lower horizons were chiefly confined to holes left by old roots and earthworms etc. In the mixtures the root systems of at least one of the component species were more strongly developed and had a greater dry weight than those of the same species in pure plots.

181.5. Reproductive Behaviour

See also Nos. 129, 161, 191–2, 239, 242–3, 541.

143. BEEFTINK, H. H. **Some observations on Tamarack or Eastern Larch (*Larix laricina* Koch) [in Alberta].** *For. Chron.* 27 (1), 1951 (38–9).

Notes on reproduction and seedling development.

144. PANOV, A. O fruktifikaciji naših četinara. [**Physiological maturity of our conifer species.**] *Šum. List* 74 (9/10), 1950 (346–59). [Croat.russ.]

Gives the following tentative ages at which 4 conifer species growing on typical sites in Bosnia attain this maturity (the first figure refers to isolated trees, the second to marginal trees, and the third to trees in stands)—*Picea abies* 25; 25–30; after 35 years; *Abies alba* 30; 35–40; after 40 years; *Pinus sylvestris* 10; 12–20; after 20 years; *Pinus nigra* 15; 15–25; after 25 years. [Cf. *For. Abstr.* 12 (Nos. 1920, 2666).]

145. HOCKING, G. H. **Some South American species of *Nothofagus*.** *N. Z. J.For.* 6 (2), 1950 (148–9).

Notes on flowering and seeding in N. Zealand.

146. MORRISON, F. T. **Flowering of *Agathis australis*.** *N.Z. J. For.* 6 (2), 1950 (149–50).

The older botanical authorities, from Hooker onwards, state that *A. australis* is dioecious, but recent observations at Waipoua Forest showed that all trees greater than 10 in. d.b.h. bear both ♂ and ♀ flowers; those in the 4–10 in. class often have flowers of both sexes, while most smaller trees have no flowers of either sex. No occurrence of staminate flowers alone has yet been recorded. It is concluded that *A. australis* as a species is monoecious, this characteristic becoming apparent only at a certain stage of development.

147. GALJPERN, G. D. Slučaï polovogo dimorfizma u sosny zamečateljnoï. [**A case of sexual dimorphism in *Pinus radiata***.] *Priroda, Moskva* 40 (3), 1951 (61). 1 ref. [Russ.] A.P.B.

In the Sochi arboretum there are two adjacent trees of *P. radiata* growing under uniform conditions and about 45 years old. One, with a normal crown, bears many cones; the other, a forked tree, bears none. The latter is interpreted as a case in which, the leader having been lost, the crown has been developed from lateral 'male' shoots. [Cf. *For. Abstr.* 12 (No. 2665).]

148. MORRIS, R. F. **The effects of flowering on the foliage production and growth of Balsam Fir.** *For. Chron.* 27 (1), 1951 (40–57). 4 refs.

Surveys were made in all types of stand to obtain data on flowering and its relation to the age, size, crown class and exposure of Balsam Fir. It was found that the primary branch terminals, leaders, and annual rings of mature Balsam Fir generally showed reduced growth in flowering years, though

annual rings also did so in drought seasons. The sections of the crown that bear most of the staminate flowers are those that, in non-flowering years, produce the greatest weight of new foliage. In a flowering year, 1947, the weight of new foliage produced by a sample of mature trees was only 27% of that produced in 1946, whereas for non-flowering trees it was 84%. Similar data for 1944 and 1950 showed that reductions of this magnitude are not unusual in heavy seed years. Of the factors measured, reduction in needle length is that most closely correlated with reduction in weight of foliage per shoot. Since needle lengths are not difficult to measure, this can be used in estimating foliage reduction. [Cf. *For. Abstr.* 13 (No. 541).]

149. Dow, A. W. **Cone production in Tamarack.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (2).

A survey was made of 17 stands of *Larix laricina* in Manitoba and Saskatchewan. Cone production seemed not to be influenced noticeably by rate of growth, health of foliage, stand density, ground cover, moisture, or successive years of defoliation by the Larch sawfly. Cones occasionally occurred on trees less than 20 years old but were not common on trees under 50 years of age. A few cones are formed every year, though good cone years probably occur only at intervals.

150. VINCIGUERRA, G. Strobili a maturazione annuale nei pini domestici di Acquaviva (Teramo). [***Pinus pinea* cones from Acquaviva (Teramo) that ripen in one year.**] *Ital. for. mont.* 6 (1), 1951 (42 + 4 photos). [It.]

Five trees of *P. pinea*, of unknown provenance, and aged 16 years, produce cones which mature and yield viable seed in the year of formation, instead of the 3 years usual in this species.

151. GARMAN, E. H. **Seed production by conifers in the coastal region of British Columbia, related to dissemination and regeneration.** *Tech. Publ. B.C. For. Serv.* No. *T*35, 1951. pp. 47 + 1 map. Price $ 0.25.

A quantitative study of production, dissemination, germination and seedling survival in seed from (1) scattered seed trees, (2) marginal timber, and (3) within a mature stand.

152. PARKER, J. **Natural reproduction from Red Cedar.** *J. For.* 49 (4), 1951 (285). [Department of Biological Sciences, University of Idaho, Moscow, Idaho.]

Observations in Duke Forest, N.C., where *Juniperus virginiana* regenerates naturally, showed that birds remove the fruit in winter, especially when snow is on the ground. In a mild winter the fruit remains on the trees till February and then drops to the ground, where some of it apparently germinates. Experiments by the author showed that seeds fed to doves were entirely destroyed by digestive action. Seed swallowed by berry-eating birds such as thrushes, starlings and waxwings, on the other hand, are not destroyed, but show improved germination. The Red Cedar reproduction which often occurs in hardwoods adjacent to open-grown Red Cedars is undoubtedly due to the action of such birds.

153. COOPER, R. W. **Release of Sand Pine seed after a fire.** *J. For.* 49 (5), 1951 (331–2).

Observation of a fire-killed stand of *Pinus clausa* showed that seedfall began less than 9 hours after the fire, and at the end of 3 weeks, more than a million seeds/acre had fallen in the dense and 420,000 in the open parts of the stand, 40% being viable. Seed dispersal appeared to be almost complete by the end of the 3rd week. Germination was first observed 50 days after the fire and a fortnight later there were *ca.* 1,000 seedlings/acre. These mostly died as a result of drought, but there were still many viable seeds buried in the soil.

154. FRASER, J. W. **Seedfall under a Red Pine [*Pinus resinosa*] stand.** *Silv. Leafl. For. Br. Can.* No. 51, 1951. pp. 2.

181.6. Life Form, Habit. Post-Seedling Development and Form. Crown Form and Crown Relations

See also Nos. 66, 148, 552.

155. MARTS, R. O. **Influence of crown reduction on springwood and summerwood distribution in Longleaf Pine.** *J. For.* 49 (3), 1951 (183–9). 7 refs.

A study was made to determine the effect of reduction of crown size on tree growth, especially its effect on wood formation in Longleaf Pine (*Pinus palustris*). Severe and continued reduction of the lower part of the crown resulted in greatly reduced ring width in the lower part of the trunk. Early wood was reduced more than late wood at the lower levels, compared with controls. Higher in the tree, near the lower limit of the crown, proportions of early and late wood varied much less. The reduced formation of early wood in the lower trunk of pruned trees persisted for several years. [Cf. *For. Abstr.* 12 (No. 327).] *From author's summary.*

156. BURGER, H. Aufästung, Entnadelung und Zuwachs bei jungen Fichten und Föhren. [**Pruning, needle-stripping and increment of young Spruce and Pine.**] *Abstracts of papers, Seventh International Botanical Congress, Stockholm* 1950. pp. 1. [G.]

Pine is less sensitive than Spruce to a reduction in assimilating organs. When all side shoots are removed, leaving needles only on the main stem, young Spruce usually die, whereas Pine survive. If the crown is reduced 50% by pruning in Pine, diameter increment is reduced, but the height growth remains the same, whereas in Spruce both are greatly reduced. If trees are stripped of needles for 10 years, leaving each year only two years' needle growth:—(*a*) height increment in Pine sinks by 2–3%, and volume increment by 15–45%; (*b*) height increment in Spruce is reduced to one-half of the normal, and volume increment to $\frac{1}{4}$ or $\frac{1}{8}$; (*c*) 17-year-old Pines bore *ca.* 40% fewer needles and produced *ca.* 40% less increment than the normal; (*d*) 15-year-old Spruce bore 80% fewer needles and correspondingly nearly 80% less increment. The experiments show that, even with Pine, two years' needle growth is not enough to produce normal development, and that, especially with Spruce, needles over 2 years old still play an important rôle in the life of the tree. The youngest (1- to 2-year-old) needles of Pine and Spruce produce,

per kg. (dry weight) of needles, 15% more increment (dry weight) than the more mature needles of plants in full leaf. A disease or climatic catastrophe that causes loss of all but 2 years' needle growth, can therefore be withstood by Pine but not by Spruce. [Cf. *For. Abstr.* 10 (No. 2346).]

157. BURGER, H. Holz, Blattmenge und Zuwachs. IX. Die Föhre. [**Wood, quantity of foliage and increment. IX. Scots Pine.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (2), 1948 (435–93 + 4 photos). 32 refs. [G.g.f.]

This study follows the same general lines as its predecessors [cf. *For. Abstr.* 12 (No. 3503)] dealing with other species, and is based on analysis of 210 trees. The results, shown in graphs and tables, relate to: (1) *Wood properties*—specific gravity of heartwood and sapwood, green and dry; water and air content of dead and living wood; and shrinkage. (2) *Crown and foliage in relation to increment in individual trees*—with data on weight of twigs, weight and number of needles, and needle area; crown area and crown volume; and correlations of these factors with d.b.h. and stemwood increment by volume weight. (3) *Crown and increment relations in stands*—with data for an 88-year-old Pine stand.

158. HOLMSGAARD, E. Produktionsvilkår og tilvækst hos stærkt beskyggede træer og grene af bøg: et bidrag til belysning af teorien om negative grene. [**Growth conditions and increment of heavily shaded trees and branches of Beech: evidence on the theory of 'negative' branches.**] *Dansk Skovforen. Tidsskr.* 35 (8), 1950 (401–29). 12 refs. [Dan.]

Briefly reviews Bavngaard's notion of 'negative' branches and the criticisms voiced by Møller and Ladefoged [see *For. Abstr.* 8 (No. 2156)], and gives a detailed account of a study made by the author in an attempt to get firm evidence on this question. To this end 56 suppressed but living branches, a number of which were accompanied by stem furrows, on overstorey trees in a 45-year-old Beech stand, were compared with 54 suppressed understorey trees of the same age, living under comparable light conditions in the same stand. Data were collected on light intensity (measured with a photoelectric cell) above and below the branches and suppressed tree crowns, and in the open. The branches and suppressed trees were then cut, and determinations were made of leaf weight and area, weight of wood and its distribution in parts under and over 1 cm. in diameter, and increment (by stem and branch analysis). Results are given in tables and graphs. If it is reasonable to suppose that suppressed branches of overstorey trees and suppressed understorey trees have equivalent assimilation when they have the same wood- and leaf-masses and are exposed to the same light conditions, Bavngaard's theory finds no support. None of the branches examined had sustained life with a smaller leaf-mass than second-storey trees in comparable conditions. No branch had an increment larger than that which comparable second-storey trees were able to produce; on the contrary, most branches showed a lower increment than comparable second-storey trees, which means that they had actually been supplying assimilation products to the remainder of the tree in spite of the unfavourable light conditions in which they lived. There was no evidence that stem furrows were associated with branches showing poor increment.

181.8. Phenology

See also Nos. 13, 136–7, 150, 225–8.

159. WILLISTON, H. L. **Height growth of Pine seedlings.** *J. For.* 49 (3), 1951 (205).

Average annual growth of *Pinus taeda* and *P. echinata* seedlings 3–9 ft. high in the Crossett, Ark., region is 86–88% complete by 4 July and 93–96% complete by 1 Aug. Average height growth in 1948, 1949, and 1950 was respectively, 2·3, 2·5, and 2·8 ft. March–July rainfall in the same years was 73, 118, and 135% of normal respectively. Amount of rainfall appears to affect the length of the growing season less than it affects the amount of height growth.

160. CELJNIKER, JU. L. K voprosu o fiziologičeskih pričinah ritmičnosti rosta u derevjev. [**Physiological causes of the rhythmic nature of growth in trees.**] *Bot. Ž. SSSR* 35 (5), 1950 (445–60). 32 refs. [Russ.russ.] [Moskovskiĭ Gosudarstvennyĭ Universitet im.M.V. Lomonosova.] P.R.

Work in 1944–5 on Orange, Lemon and Apple, at the Vsesojuznyĭ Institut Čaja i Subtropičeskih Kuljtur, in Georgia, showed that nucleic acids accumulate in the meristem of shoot growing-points before growth starts, but decrease during the period of visible growth. A considerable drop in nucleic-acid content leads to cessation of growth, and in extreme cases to death of the growing-point. The normal cessation of growth is followed by an accumulation of nucleoproteins, which suggests that 'dormancy' is a necessary stage during which sufficient material for further growth is accumulated. Results are given in tables and graphs.

182. *Synecology, Plant Sociology: General, Principles and Methods*

See also No. 190.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 164, 175, 178, 189.

161. WYATT-SMITH, J. ***Archytaea vahlii* Choisy (Riang-riang).** *Malay. Forester* 14 (1), 1951 (36–8).

In 1930 a sample plot was laid down in an area of semi-swamp forest consisting of an almost pure crop (*ca.* 90%) of *Archytaea vahlii* 30–40 ft. high, associated with *Alstonia spathulata*, *Melaleuca leucadendron* and *Cratoxylon arborescens*. The objects were: (1) to determine whether it is possible to regenerate such an area of pure *A. vahlii* that has reached commercially exploitable size; (2) to study the means by which the species regenerates itself; and (3) to observe the general effect of thinning. It appears from these observations that *A. vahlii* forest usually represents a seral stage in the phenomena of plant succession from bare, swampy and badly drained old mining land to the high-forest climax. In such it cannot be expected to regenerate itself, since it is altering the watertable and building

up the soil, thereby making the site unsuitable for itself but rendering it available to high-forest species. In some cases, however, it appears to be a subclimax, possibly owing to extraneous factors affecting the watertable. The general effect of all grades of thinning was unfavourable. The average maximum girth reached by this species is 12–15 in.

182.5. Synecological Measurements and Methods

162. DANSEREAU, P. **Description and recording of vegetation upon a structural basis.** *Ecology* 32 (2), 1951 (172–229). Numerous refs.

Reviews various approaches to the study of vegetation, outlines the structural-physiognomic point of view, and proposes a new system in which 6 series of criteria are used: (1) life form, (2) size (3) function, (4) leaf shape and size, (5) leaf texture, and (6) coverage. The grading of vegetation can be carried out either by formulæ or by diagrams. Various applications of the new system are presented, showing the similarities and differences between communities of a sere or a clisere and communities of widely separated but more or less analogous areas. *From author's summary.*

187. *Vegetation Types*

See also Nos. 15–8, 29.

163. DREES, E. M. Enkele opmerkingen betreffende de classificatie van bossen naar hun ontstaanswijze. **[Some remarks on the classification of forest types according to their mode of origin.]** *Tectona* 40 (2), 1950 (135–53). [Du.E.]

Discusses the possibility of an objective classification of forest types based on their mode of origin and wholly excluding all ecological, floristic, geographical and other considerations. A tentative classification is presented, with suggested German and French as well as Dutch and English names for the different types. The basic division is between (*A*) *Natural forest* (to the establishment and modification of which no human influence has contributed even indirectly) and (*B*) *Anthropogenic forest* (established or modified by human influence, direct or indirect, now or in the past). Both (*A*) and (*B*) are subdivided into (1) primary, (2) secondary, and the secondary types are again subdivided according to the dominant causative factors—fire, flooding, grazing by wild animals, action of volcanoes, and erosion in the case of (*A*) and fire, grazing by domestic animals, agriculture, silvicultural measures, and over-exploitation in the case of (*B*).

164. KASSAS, M. **Studies in the ecology of Chippenham Fen. I. The fen water-table. II. Recent history of the fen, from evidence of historical records, vegetational analysis and tree-ring analysis.** *J. Ecol.* 39 (1), 1951 (1–32 + 2 photos). 19 refs. Cf. *For. Abstr.* 12 (No. 2764).

165. MICHEL, A. **La limite altitudinale de la végétation forestière dans les Pyrénées-orientales. [The altitudinal limit of forest vegetation in the Eastern Pyrenees.]** *Rev. for. franç.* 1951 (4), (274–80 + 2 photos). [F.]

166. BAY, E. **Condizioni ecologico-forestali della valle dell' Aterno. [Forest ecology of the Aterno valley.]** *Monti e Boschi* 2 (3), 1951 (123–34). [It.f.e.]

167. TEIVANEN, L. **Pisavaaran luonnonpuiston metsäkasvillisuudesta ja kasvistosta. [The forest vegetation and flora of the Pisavaara nature reserve, N. Finland.]** *Silva fenn.* No. 65, 1949. pp. 34. 18 refs. [Fi.g.]

168. HSU, Y.-C. **A preliminary study of the forest ecology of the area about Kunming.** *Contribution from the Dudley Herbarium, Stanford, Calif.* 4 (1), 1950 (1–12). 3 refs.

169. SINGH, J. **Note on ecological changes in the transitional belt between the wet zone and the dry zone in Kanawar.** *E. Punjab For. Notes* 1948. pp. 36. 8 refs.

Certain species of the wet zone, e.g. *Quercus incana, Q. dilatata, Rhododendron arboreum, Pinus longifolia, Aesculus indica* and others, do not occur outside the monsoon belt; others, e.g. *Q. semicarpifolia, Taxus baccata* and *Corylus colurna* do occur in favourable sites for some distance outside. Certain dry-zone species, e.g. *Q. ilex, Daphne oleoides, P. gerardiana* and *Fraxinus xanthoxyloides,* also occur in this transitional zone. *Pinus excelsa* grows outside the monsoon belt, but does not regenerate readily and is subject to serious infestation by *Arceuthobium minutissimum,* which does not occur in areas where the rainfall exceeds 35 in.

170. JACKSON, J. K. **The Imatong forest reserve.** *Sudan Silva* 1 (3), 1950 (15–9).

Briefly describes the reserve and some of the vegetation types, notably the montane Podocarp forest and lowland tropical rain forest.

171. SCHNELL, R. La forêt dense: introduction à l'étude botanique de la région forestière d'Afrique occidentale. **[The equatorial rain forest: introduction to the botanical study of the forest region of [French] West Africa.]** Paul Lechevalier, 12 Rue de Tournon, Paris 6. 1950. pp. 330. 200 refs. [F.] Price *Fr.*3,000 (£3. 8*s.*).

The first part of this monograph on the rain forest of (mainly) the Ivory Coast and French Guinea, is a general account of soils, composition, ecology, history and resources (138 pp.). The second part consists of a set of keys for the identification of the commonest and most interesting tree species of the region (62 pp.). There are also an analytical table of families (9 pp.), a list of the principal tree and shrub species (50 pp.), a list of the principal timbers (5 pp.), a number of botanical drawings, and an alphabetical list of vernacular names (11 pp.).

172. EMBERGER, L., MANGENOT, G., and MIÈGE, J. Existence d'associations végétales typiques dans la forêt dense équatoriale. **[The existence of typical plant associations in dense equatorial forests.]** *C.R. Acad. Sci., Paris* 231 (14), 1950 (640–2). 1 ref. [F.f.] O.R.S.

An analysis of the flora of forests in the Ivory Coast region showed the existence of a number of plant associations. The composition of two of these, characterized by *Turraeanthus africana* and *Heisteria parvifolia* on miopliocene soils, and by

Diospyros spp. and *Mapania* spp. on precambrian soils, is described.

173. EMBERGER, L., MANGENOT, G., and MIÈGE, J. Caractères analytiques et synthétiques des associations de la forêt équatoriale de Côte d'Ivoire. **[Analytical and synthetic characteristics of equatorial forest associations of the Ivory Coast.]** *C.R. Acad. Sci., Paris* 231 (17), 1950 (812–4). 3 refs. [F.f.] O.R.S.

The associations are shown, despite certain peculiarities, to have the same essential structural and statistical characters as those of the temperate zone.

174. HUSTICH, I. **Phytogeographical regions of Labrador.** *Arctic, Montreal* 2 (1), 1949 (36–42). 4 maps. R.S.G.S.

A preliminary attempt at a classification.

175. BRAUN, E. L. **Deciduous forests of Eastern North America.** Blakiston Co., Philadelphia and Toronto. 1950. pp. xiv + 596 + 1 map. 538 refs. Price $10.00 [£4].

The author's purpose is stated to be:—(1) to give a broad and co-ordinated account of the entire deciduous forest, portraying first what is (or was) present in any geographic area and attempting to reconstruct the pattern of original forest; (2) to give data on composition and aspect of forest communities in all parts of the deciduous forest; and (3) to trace through geological time the development of the present pattern of forest distribution.

176. PUTNAM, J. A. **Management of bottomland hardwoods.** *Occ. Pap. Sth. For. Exp. Sta.* No. 116, 1951. pp. 60. 12 refs. Also in *Sth. Lumberm.* 182 (2281), 1951 (36–46, 48).

Principles and practice are discussed under the following heads: preliminary survey (site, forest types, stand classes, timber utility, quality and condition, logging conditions, markets and protection); essentials of early management (protection, division into compartments and the first managed felling); influence of utilization on management; regeneration; stabilized management (inventories, growth determination, stocking and stand structure and permissible fellings); and forestry potentials in the bottomlands. Appendixes correlate the broader forest types defined in the bulletin with the standard cover types of the eastern U.S.A.; and list, with their main characteristics and uses, the important bottomland species; also species occurring but uncommon in the southern bottomlands.

177. STEARNS, F. **The composition of the Sugar-Maple—Hemlock—Yellow Birch association in northern Wisconsin.** *Ecology* 32 (2), 1951 (245–65). 39 refs.

178. BUELL, M. F., and CANTLON, J. E. **A study of two forest stands in Minnesota with an interpretation of the prairie-forest margin.** *Ecology* 32 (2), 1951 (294–316). 42 refs.

Evidence based on a study of two communities dominated by *Acer saccharum* and *Tilia americana* indicates that the Maple/Basswood forest has recently invaded the prairie, and that, in one case, it has succeeded a Pine-Oak community. The most likely cause of these successions is thought to be a change in climate. *From authors' summary.*

179. NORRIS, F. H. **Primary forest types of Highland County, Ohio.** *Abstracts of doctoral Dissertations, Ohio State University, Columbus* No. 58, 1948/9 (1950), (319–22). L.S.

2. SILVICULTURE

See also Nos. 118–9, 123–5, 176, 559.

180. NESTEROV, V. G. Obščee lesovodstvo. **[The biological foundations and practice of silviculture.]** Goslesbumizdat, Moscow and Leningrad. 1949. pp. 664. Numerous refs. [Russ.] Price *Roubles* 22.75.

The subject matter of this university textbook corresponds broadly but not entirely with that of the foundations and practice of silviculture as generally defined; the minor differences will be clear from the following contents list: *Part I. Foundations of silviculture* (pp. 19–333)—The general concept of the forest as an entity; non-homogeneity of the forest and the silvicultural characters of stands; soil relations; atmospheric relations; relations with the animal world; the living ground cover; the reproduction of trees and stands; development and structure of stands; succession, alternation of dominants; the science of forest types. *Part II. The practice of silviculture* (pp. 337–648)—Economic and natural bases; measures to aid natural regeneration; tending; intermediate fellings; principal fellings (classification, silvicultural systems); analysis of research on principal fellings in the chief types of forest in the U.S.S.R.; harvesting of minor forest products; forest fires and their control.

There are 102 illustrations (line drawings, diagrams and photos), bibliographies at the end of each chapter, and a brief subject index.

181. WESTVELD, R. H. **Applied silviculture in the United States.** John Wiley & Sons, Inc., New York; Chapman & Hall Ltd., London. 2nd ed. 1949. pp. 590. Many refs. Price $6.00 [48*s.*]

The chief object in this revision was to include the advances in silviculture in the 10 years since the book was first published. This has necessitated a few fundamental changes. The most important of these is concerned with the handling of data on prices, costs and profits. Gradual inflation since 1941 makes values expressed in dollars meaningless, and most of the monetary values have therefore been replaced by man-hours or by ratios to show relative values. Changes have also been made in tree names and type classification, for which the respective authorities are now the *Check list of the native and naturalized trees of the United States* (1944) and *Forest cover types of Western North America.* The arrangement, as in the 1st edition, is by forest regions.

182. Guerreiro, M. Gomes. Estudos realizados no castanheiro em 1948. [**Research on Chestnut in 1948.**] *Boletim da Junta Nacional das Frutas, Lisboa* 9 (1), 1949 (13–40). [Port.e.f.] L.S.

A review of research done during the year on: (1) breeding, particularly for resistance to ink disease [cf. *For. Abstr* 13 (No. 428)], (2) vegetative propagation, (3) studies of yield in coppice stands to determine at what age the maximum yield of firewood is obtained, and (4) nursery work.

183. Nanayya, K. M. **Sandal forests in Coorg.** *Indian For.* 75 (3), 1949 (1951), (87–90).

Recommendations for silvicultural treatment.

22. SILVICULTURAL SYSTEMS. CONSTITUTION AND COMPOSITION OF STANDS; FORMS OF STAND

221. *High Forest Systems*

See also Nos. 192, 307.

184. Holt, L. **Cutting methods in pulpwood operations of eastern Canada.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 84 (*F*–2), 1950. pp. 58. 42 refs.

Contains sections on growth factors, cutting methods and silvics, cutting methods and economics, cutting methods and forest management, examples of cutting methods used in the pulpwood industry, cutting methods and regeneration, and cutting methods and Halliday's forest classification.

185. Fowells, H. A., and Schubert, G. H. **Natural reproduction in certain cutover Pine-Fir stands of California.** *J. For.* 49 (3), 1951 (192–6). 3 refs.

Pine (*Pinus ponderosa* and *P. lambertiana*) seed trees were left at a rate of 3·6/acre in *P. lambertiana*/*Abies concolor* and *P. lambertiana*/*P. ponderosa*/*A. concolor* types of the Sierra Nevada. After 20 years Pines had become established at only 70/acre, forming but 5% of the reproduction, which consisted mainly of *A. concolor* and *Libocedrus decurrens*. Distribution of reproduction was poor and growth slow. More than 72% of advance reproduction had been destroyed by logging, and of that surviving after 20 years, 11% or 100/acre were Pines.

186. Sarvas, R. Tutkimuksia Perä-Pohjolan harsimalla hakattujen yksityismetsien luontaisesta uudistumisesta. [**Investigations into the natural regeneration of selectively cut private forests in Northern Finland.**] *Commun. Inst. for. Fenn.* 38 (1), 1950. pp. 95. 100 refs. [Fi.e.]

Deals mainly with Scots Pine. In the Pine stands of Cajander's *EC* and *EM* types, seeding of Pine is abundant enough to afford favourable opportunities for natural regeneration. In the mixed Pine/Spruce stands of the *EM* type, on the other hand, seeding of Pine is so poor that, for this reason alone, regeneration of Pine is necessarily defective and slow. Regeneration occurs in all but the very driest years. The number of Pine seedlings in selectively cut Pine stands of *EC* and *EM* types is usually abundant averaging 22,986/ha. for seedlings over 0·1 m. in height, with an additional 33,962 below 0·1 m. for *EC* and slightly less for *EM* types. In Pine/Spruce stands of *EM* type, however, Pine seedlings average only 502/ha. for those over 0·1 m. high, with 167/ha of smaller ones. In about 37% of selectively cut Pine stands there is enough advance growth to ensure full stocking before the final cutting is effected. Another 26% of such stands are fully stocked within 10 years after the final cutting, but for the remaining 37% the regeneration period exceeds 10 years. The effect of selective cutting is discussed and it is concluded that such cutting is at least partly responsible for the increase in Spruce at the expense of Pine in N. Finland, and that some form of shelterwood cutting would give better results. In general, conditions for the regeneration of Pine appear to be more satisfactory in North than in South Finland. [Cf. *For. Abstr.* 12 (Nos. 1074, 2862).]

187. Hausendorff, E. Erweiterung der Grundlagen des Dauerwaldgedankens. [**Extension of the bases of the *Dauerwald* concept.**] *Z. Weltforstwirt.* 13 (10/12), 1950 (194–203). 33 refs. [G.]

A re-exposition and defence of Möller's conception of *Dauerwald*, with particular reference to the N. German Pine region and to the support to be found for Möller's ideas in the work of Weck. [Cf. *For. Abstr.* 9 (No. 827).]

226. *Changes of Silvicultural System. Conversion (by System or Species)*

See also No. 378.

188. Lončar, I. Pretvorba čistih nizinskih hrastika u mješovite sastojine. [**Conversion of pure lowland Oak forests into mixed stands.**] *Šum. List* 74 (11), 1950 (441–6). [Croat.e.]

It is suggested that the improvement of lowland pure Oak forests that have been extensively damaged by drought, can be effected by underplanting and beating-up with Hornbeam, Maple, Ash, Walnut, Locust, and 'Canadian' Poplar. Oak forests not yet damaged by drought should also be underplanted. It is important to use large plants (up to 2 m. high) at not less than 1·5–2 m. spacing. Poor-quality Oak should be felled before introducing the other species, and dense stands should be thinned.

228. *Constitution and Composition of Stands; Forms of Stand*

See also No. 142.

189. Denisov, A. K. Nekotorye zakonomernosti estestvennogo razvitija dubrav. [**Some regularities in the natural development of Oak woods.**] *Lesn. Hoz.* 3 (4), 1950 (41–2). [Russ.]

Gives the results of age determinations in two presumably virgin Oak woods in the Mari A.S.S.R.:—(1) Felling of all trees on a plot of 1·5 ha. in Oak with a second storey of Lime, revealed that the Oak was essentially two-aged. Of the 17 trees aged 240–290 years, 5 were 260–270 and 8 were 270–80; and of the 236 trees aged 90–170, 50 were 120–130, 118 were 130–140, and 28 and 23 were respectively 110–120 and 140–150. There were no trees between 170 and 240 years old. The regeneration represented by the younger trees presumably arose when the preceding stand for some reason became open, the

maximum occurring when the latter was *ca.* 140 years old. (2) A stand in a valley on the boundary of Mari A.S.S.R. and Kirov Province is estimated from a limited sample to contain the equivalent of 102 trees/ha. 159–180 years old and 2,100 aged 23–33.

Both of these cases are regarded as evidence against the notion of all-aged structure and continuous reproduction in virgin forest.

23. REGENERATION AND FORMATION OF STANDS

190. FABIJANOWSKI, J. Untersuchungen über die Zusammenhänge zwischen Exposition, Relief, Mikroklima und Vegetation in der Fallätsche bei Zürich. **[Investigations into the relationship between aspect, topography, microclimate and vegetation in the Fallätsche near Zürich.]** *Beiträge zur geobotanischen Landesaufnahme der Schweiz, Bern* No. 29, 1950. pp. 104 + 10 photos. 31 refs. [G.g.] [Pflanzengeographische Kommission der Schweizerischen Naturforschenden Gesellschaft.]

A detailed ecological study was undertaken in order to discover the basic principles to be observed when planning reforestation. It was abundantly confirmed that, particularly in mountainous regions, quite small areas must be taken as a unit when studying differences in soil and plant successions. The close relationship between temperature, air and soil moisture, transpiration, aspect, and vegetation, was clearly demonstrated. I aboratory experiments showed that germination and wilting of different species is not directly dependent on absolute soil moisture but varies with the type of soil. The dangers to natural regeneration of erosion are considerable, and it is therefore important to introduce grass cover into clear-felled areas. A scheme for the Fallätsche based on the ecological study is presented.

231. *Natural Regeneration*

See also Nos. 129, 143–54, 161, 185–6, 189, 201, 881

191. **Natural regeneration.** *Rep. Sth. For. Exp. Sta.* 1950 [1951] (18–20).

On poor sites, good second-growth Longleaf Pine seed-trees were found to produce 2–10 thousand seeds per tree in 4 out of 5 years. Large Longleaf cones produced more and heavier seed than smaller cones from the same trees. There appear to be about 100 seeds, each weighing 85 mg., in a 6-in. cone, but the number of seeds per cone and the weight of the seed will vary directly with cone length, at a rate of *ca.* 28 seeds per cone and 16 mg. in weight per seed for each inch difference in length.

Longleaf seedling growth on small plots where Pine logs had been burned was double that on plots where 14- or 15-year rough grass was burned just before seedfall, even though wood ashes were added to the latter plots. A small test indicated that allyl alcohol applied at a rate of 50 gal./10,800 gal. water/acre before seeding in November will reduce grass competition enough to stimulate seedling development significantly.

Loblolly Pine reproduction did much better under an under-storey than Shortleaf. Competition for soil moisture and nutrients appeared to be more critical than competition for light.

192. SMITH, D. N. **The influence of seedbed conditions on the regeneration of Eastern White Pine.** *Bull. Conn. agric. Exp. Sta.* No. 545, 1951. pp. 61. 67 refs.

From a review of the literature and his own studies, the author concludes that the variable influence of seedbed conditions on germination and early survival of *Pinus strobus* seedlings is almost confined to areas exposed to direct sunlight. These variations are due chiefly to differences in the efficiency with which seedbed materials dissipate heat received from the sun. Seedbeds that lose heat slowly, attain high surface temperatures which cause significant reductions in germination and also kill many seedlings. Heavy shade is conducive to good germination, but seedlings soon die of damping off. It is concluded that White Pine regeneration is best obtained by fellings that allow a minimum of direct sunlight and a maximum of diffused light to reach the forest floor. Once established, however, the seedlings will grow satisfactorily only if direct sunlight is increased to a maximum. Shelterwood fellings, applied either uniformly or in strips, are best adapted to supply this sequence of conditions.

193. LOGAN, K. T. **Influence of thinning on reproduction beneath a Red and White Pine stand [in Ontario].** *Silv. Leafl. For. Br. Can.* No. 50, 1950. pp. 3.

Preliminary indications from experiments with varying degrees of thinning, 15 years after treatment, were that thinnings had increased the survival rate, and slightly improved the growth of White Pine seedlings, but had not affected reproduction of the more desirable Red Pine.

194. **Problem of poor growth under 'shelter' in the Dry Evergreen Forest.** *Rep. Conserv. For. Ceylon 1949*, 1951 (G7).

Investigations were continued on the causes responsible for the failure of artificially introduced plants and natural regeneration to make satisfactory growth and establish themselves under partial shade following the opening up of the overwood in the dry mixed evergreen forests of Ceylon. It had been assumed that the beneficial effects of segregation trenching were due to accumulation of moisture in the trenches and would be obtained only with water-loving species such as *Berrya cordifolia*. Results showed these assumptions to be unjustified. Unusually profuse natural regeneration of *Chloroxylon swietenia* was obtained on trenched plots in recent trials.

195. **[Disking to stimulate Aspen reproduction.]** *Rep. Lake St. For. Exp. Sta.* 1950 [1951] (11–2).

Four understocked Aspen areas were disked in strips 8–12 ft. apart at a cost of *ca.* $2.50 per acre. Results, after one growing season, are tabulated, and show much increased stocking on the disked areas. On a favourable site, stocking is about 90% as against 60–80% on the control. [Cf. *For. Abstr.* 12 (No. 264).]

232. *Artificial Regeneration*

See also Nos. 118–9.

196. MARRERO, J. Resultados de la repoblación forestal en los Bosques Insulares de Puerto Rico. [**Results of reforestation in the Insular forests of Puerto Rico.**] *Carib. For.* 11 (4), 1950 (151–95). 14 refs. [Span.span.] [Tropical Forest Experiment Station, Rio Piedras.]

Presents brief descriptions of the different types of the Insular (as opposed to the Federal) forests in Puerto Rico, with an account of reforestation work accomplished up to date (species, methods and costs) and the results of a study of the present state of the stands. Large-scale planting began in 1920, but most of the reforestation was done between 1934 and 1941. By June 1949 a total of 13,163,000 seedlings and wildings, and 91,230 lb. of seed had been planted. In general, weeding was necessary up to the first 2–4 years, and cutting of vines sometimes continued until the 10th year. A variety of sites exist within each type of forest and the success of the work depended largely on the adaptability of the species to the site. Different kinds of site are described in detail, and the suitability of different species is recorded and discussed. The use of bituminized paper pots for planting out in dry sites is recommended. Reforestation supplemented by natural regeneration has resulted in plantations of which 64% can be classed as well stocked. Costs were high because of many failures and replacements, and the long period of upkeep, particularly where ill adapted species were slow in dominating the rest of the vegetation. Other causes of loss were the employment of large numbers of workers (part of a measure to prevent unemployment) and a failure to take account of important differences in climate and soil throughout the island.

197. SCARAMUZZA, L. C. **The Eucalyptus and the reforestation at the sugar mills.** *Proceedings of the 21st Annual Meeting of the Asociación de Técnicos Azucareros de Cuba, Havana* 1947 (115–23). 10 refs. [E.] L.S.

Summarizes work in the planting of Eucalypts in Cuba, where about 50 species are being tried out. Successful transplantings have been done in pots made from bitumen paper [cf. *For. Abstr.* 13 (No. 281)]. The transplants are placed in prepared soil in rows 10 ft. apart, beans, peanuts and cotton being planted between the rows. The plantations must be kept clear of weeds for the first 2 years. It is estimated that one 'caballería' [about 33½ acres] can be planted at a cost, from seedbed to the final transplanting, of *ca.* $2,400.

198. HESMER, H. [Editor]. Die Technik der Fichtenkultur. [**The technique of Spruce growing.**] Verlag M. & H. Schaper, Hannover. 1950. pp. viii + 197. Numerous refs. [G.] (*Mitteilung, Technische Zentralstelle der Deutschen Forstwirtschaft* No. 9.) Price *DM*7.50 [13*s.* 2*d.*].

A symposium dealing with different aspects of Spruce growing. The subjects treated are:—(1) development of Spruce cultivation techniques (*Hesmer*); (2) preparatory work (*Müller-Thomas*); (3) manuring (*Wittich*); (4) planting (*Strehlke*); (5) sowing (*Mantel*); (6) cultivation in mixture (*Rupf*) (7) tending (*Hengst*); and protection (*Schwerdtfeger*).

232.1. Choice and Trial of Species, Races etc.

See also Nos. 323–6, 329.

232.11. *Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.*

See also Nos. 89, 295–6, 326.

199. HAUSENDORFF, E. Für und wider die Robinie. [**For and against *Robinia pseudoacacia.***] *Forstwiss. Cbl.* 70 (4), 1951 (235–47). 12 refs. [G.]

Discusses the results obtained in Hungary with this species and its possibilities in Germany. [Cf. *For. Abstr.* 13 (No. 323).]

200. WOOD, A. S. **Growth figures for Douglas Fir [in Herefordshire].** *Quart. J. For.* 45 (2), 1951 (123–4).

201. NUNES, J. ROSADO. Notas ácêrca do *Douglasii* na Serra da Estrêla. [**Notes on *Pseudotsuga taxifolia* in the Sierra d'Estrella.**] *Publ. Serv. flor. aqüic. Portugal* 10 (2), 1943 (303–11). [Port.e.]

Short notes on growth, regeneration and propagation from seed in this area. Measurements taken in the Carrascal forest showed that growth conditions equal those of the first site-quality class in the Pacific Northwest. Growth at an altitude of 870 m. in the Manteigas forests is similar to that found between 450 and 600 m. in the Pacific Northwest. When propagating, seed should be sown sparsely, or else pricked out early, i.e. 8 months after germination, as Douglas Fir makes very little growth in the first, and often little in the second year after pricking out. The selection system is recommended for this area.

202. GUINIER, [P.] Quelques résultats de la culture d'essences exotiques (sapin de Douglas, Thuja géant) dans le domaine d'Harcourt. [**Some results of the cultivation of exotic species (Douglas Fir, Western Red Cedar) on the Harcourt estate.**] *C.R. Acad. Agric. France* 37 (2), 1951 (75–7). [F.] A.P.B.

The present state of development of a stand of *Pseudotsuga taxifolia*, planted in the forest in 1860–65, indicates that a plantation of 250 trees per ha. in this area would produce a yield of about 800 cu.m./ha. at the age of 85. Similar notes on *Thuja plicata* show that at the age of 80 years a stand of 250 trees per ha. would yield about 400 cu.m./ha.

203. POURTET, J. De l'introduction de quelques essences dans les reboisements de l'est de la France. [**The introduction of some species in reforestation in eastern France.**] *Livret du Cinquantenaire, Société forestière de Franche-Comté, Salins-les-Bains, 1946*, 1947 (219–26). [F.]

Douglas Fir and *Abies grandis* are recommended to supplement and replace *Pinus sylvestris* and European Larch on siliceous soils. Douglas Fir does well on the deeper and *Abies nordmanniana* on the shallower calcareous soils, while *Cedrus atlantica* has given good results near Dijon. For the rich valleys, small-scale plantings of *Juglans nigra* and *Carya* spp. are recommended, with Poplars, and in rather warmer districts *Robinia pseudoacacia.*

204. ROSAY. Plantation d'*Abies grandis*. [**A plantation of *A. grandis*.**] *Rev. for. franç.* 1951 (6), (401–3). [F.]

The plantation was made in 1914 at an altitude of 600 m. in Haute-Savoie at a rate of 2,000/ha. and received neither cleaning nor thinning. When felled in 1949 the stand had reached the following dimensions: mean merchantable length 22·2 m., mean g.b.h. 160 cm., mean volume of trees felled 2·05 cu.m., total volume/ha. 360 cu.m., m.a.i./ha. 46 cu.m. The trees were all sound when felled but the quality of the wood was not very high.

205. COINTAT, M. Station de chênes exotiques à Saint-Marcel de Carreiret (Gard). [**A stand of exotic Oaks [*Q. coccinea* and *Q. cerris*] at St. Marcel de Carreiret (Gard).**] *Rev. for. franç.* 1951 (4), (268–73). [F.]

Includes data on growth of these two species and *Q. pubescens* for comparison. *Q. coccinea* is markedly superior to all the native Oaks in this area.

206. CALDART, F. Osservazioni sul pino di Weymouth (*Pinus strobus*). [**Notes on *P. strobus*.**] *Monti e Boschi* 2 (4), 1951 (161–4). [It.f.e.]

Notes on a plantation of *P. strobus* in Piedmont. At the age of 48, total volume was 800 cu.m./ha., representing a m.a.i. of 16·6 cu.m./ha. The possibility of using this species for afforestation in Italy is discussed.

207. JURKEVIČ, I. D. O raĭonirovanii kuljtur bereskleta evropeĭskogo. [**Regions suitable for plantations of *Euonymus europaeus*.**] *Lesn. Hoz.* 3 (3), 1950 (36–9). [Russ.]

Though *E. europaeus* has a gutta-percha % lower than that of *E. verrucosus*, its actual yield is 2–4 times greater owing to its rapid growth and high yield of root-bark at maturity. In 1946 a conference at the Forest Institute of the U.S.S.R. Academy of Sciences recommended studies with a view to extending the cultivation of this species outside its natural range—the S.W. of Russia. The author records satisfactory growth of planted specimens in the N. and E. of Russia and tabulates data from Buzuluk, Chkalov Province, as evidence of the superior yield of root-bark of a 10-year-old *E. europaeus* plantation, compared with (1) planted and indigenous *E. verrucosus* in the same locality, and (2) *E. europaeus* within its natural range, in White Russia. It is suggested that *E. europaeus* could probably succeed as far N. and E. as Leningrad, Cherepovets, Kirov, Molotov, Ufa and Chkalov. In conclusion a diagram is given, as an aid to site selection within this region, showing the forest types (Sukačev's system) in which the two species occur naturally. The evidence collected on this point indicates that *E. europaeus* is associated with somewhat moister and richer soils than *E. verrucosus*.

208. MALJCEV, M. P. Razvedenie barhata amurskogo na Severnom Kavkaze. [**Cultivation of *Phellodendron amurense* in N. Caucasia.**] *Lesn. Hoz.* 3 (4), 1950 (68–72). [Russ.]

P. amurense, first introduced into N. Caucasia in 1930, has been widely planted, mostly in the N. Osetia A.S.S.R., where some 2–3 years ago there were already some 17,000 trees aged 7 years and more, many bearing seed. Most have been grown in mixture with other hardwoods predominating, and pure stands or mixtures with a predominance of *P. amurense* are rare. The author reviews data on the increment of young trees of this species in mixture with different species in various localities, including figures for timber, cork, and total bark volumes, and compares these with its performance in its natural range in the Far East. He concludes that further cultivation in this region is fully justified. *P. amurense* in the N. Caucasus has so far grown as fast as in its native habitat, has a satisfactory cork yield and is capable of producing valuable timber. It has not suffered from low temperatures, insect pests or fungi, and bears good seed from the age of 7–8 years onwards. The best growth has been observed on alluvial floodplain soils and moist clay-loams; on drier sites it is slower, but is greatly aided by its strong root system. If given too much room, its crown is apt to fork and spread excessively and therefore to suffer from snow or wind breakage. Up to 10 years old, it should be grown with sufficient side shade from shrubs such as Hazel, *Rhus cotinus*, *Acer tataricum*, or auxiliary tree species, good associates being *inter alia* Elm, *Acer campestre* or *Fraxinus pennsylvanica*.

209. URBAS, J. O nasadih sitke (*Picea sitchensis*) v Slovenji. [**Plantations of Sitka Spruce in Slovenia.**] *Gozd. Vestn.* 9 (1/2), 1951 (20–6). [Sloven.]

A general account, which includes detailed measurements (tabulated) for a small plot on the Škrbsovo estate as at 26 Aug., 1948.

210. KAWADA, M., and YAMAJI, K. **Study of the results of European Spruce planting in Gumma Prefecture [,Central Honshu; with notes on trials of other exotic species].** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 41, 1949 (63–84). 5 refs. [Jap.jap.e.]

Thirty-four exotic species grown at the Forest Experiment Station, Meguro, Tokyo, are listed with an indication of their success. Those giving the best results were *Pinus rigida*, *P. strobus* and *Tsuga canadensis*, while *Pinus bungeana*, *P. radiata*, *P. sylvestris*, *Thuja plicata*, *Fraxinus excelsior*, *F. americana* and *Juglans nigra* failed completely. Results for *Picea abies* showing tree survival, volume, mean diameter and height, are tabulated. *From authors' summary.*

211. KHAN, M. I.-U.-R. **Introduction of exotic species in the Punjab.** *Pakistan J. For.* 1 (2), 1951 (136–43). 12 refs.

A historical account, listing the most successful ornamental trees.

212. CARDOSO, J. G. ALFARO. **The planting of indigenous species in Portuguese East Africa.** *S. Afr. J. Sci.* 47 (9), 1951 (264–6).

A summary of nursery and plantation experiments with *Pterocarpus angolensis*, *Afzelia quanzensis*, *Androstachys johnsonii*, *Khaya nyasica*, *Millettia stuhlmannii*, *Albizzia gummifera* and *Chlorophora excelsa*. Tables show the superior increment of weeded over unweeded plantations of the first 3 species and of *K. senegalensis*, and the growth and

development of the first 6 species, *Cordyla africana* and *Entandrophragma caudatum* in pure plantations varying from 7 to 22 years old.

213. **[*Populus deltoides* plantation in Bechuanaland.]** *Rep. For. Dep. Bechuanaland 1950* [? 1951] (1).

A plantation of *P. deltoides* was started in 1943 [cf. *For. Abstr.* 6 (159)] at Mogobane on deep, rich, alluvial soil that is usually inundated once or twice a year. Growth has been very satisfactory and the stand has now been thinned to 390 stems/acre.

214. Louvel, M. Notes sur les forêts malgaches de l'Est (suite). **[Notes on the eastern Madagascar forests.]** *Rev. int. Bot. appl. Agric. trop.* 31 (341/342), 1951 (185–96). [F.] P.R.

[Cf. *For. Abstr.* 12 (No. 1914).] *Eucalyptus* spp. have given excellent financial returns in Madagascar, and many landowners have supplanted the native forest with them; unfortunately this has led to a drying-up of the springs. *Acacia decurrens* is widely cultivated for tannins, and has been used for producer-gas fuel. Other introduced species are *Pinus khasya, P. maritima, P. patula, P. longifolia, Cryptomeria japonica, Widdringtonia whytei, Araucaria angustifolia, Melia azedarach, Melaleuca leucadendron, Grevillea robusta*, and *Cedrela odorata*. Softwoods are valuable for the dry soils of the high plateaux, but fire is a grave danger and the provision of firebreaks is essential.

215. Cook, D. B. **Concluding notes on a Larch [*Larix decidua*] plantation.** *J. For.* 49 (5), 1951 (359–60).

Cf. *For. Abstr.* 8 (No. 754).

216. Ferguson, J. H. A. ***Eucalyptus deglupta* Bl.** *Tectona* 40 (1), 1950 (51–61). [Du.e.]

Silvicultural characters, wood properties and uses, and growth in sample plots in Indonesia.

217. **[Growth of *Flindersia brayleyana* in plantations.]** *Rep. Qd. For. Serv. 1949–50*, 1950 (6).

Yield plots in Maple (*F. brayleyana*) plantations show that this is a quite productive plantation tree. At 20 years, average g.b.h. is 27 in., average pre. height 70 ft., b.a./acre 130 sq. ft., and volume to 4 in. d.u.b. 3,000 cu. ft. Natural pruning is quite good, small thinnings can be used, and the wood is not susceptible to Lyctus attack.

232.12 *Races and Provenance Trials.*

See also Nos. 14, 80.

218. Rubner, K. Die Tatralärche. **[Tatra Larch.]** *Forstwiss. Cbl.* 70 (3), 1951 (129–61). 39 refs. [G.]

A detailed study of the distribution, ecology and silvicultural characters (particularly climatic requirements) of Tatra Larch. The main factors in its distribution in the Tatra seem to be lack of suitable sites and competition from other species. Fire and grazing, however, facilitate its establishment, since Spruce, its chief competitor, does not regenerate easily on mineral soil. Consequently the distribution of Larch is favoured, on the whole, by agricultural and silvicultural practices. As a wind-firm species it is an important associate of Spruce in the Tatra where Fir and Beech are few. Growth trials in Württemberg and Saxony, although satisfactory, show that it does not equal Sudeten Larch and is therefore not likely to be used outside its native region.

219. Fischer, F. Ergebnisse von Anbauversuchen mit verschiedenen Fichtenherkünften (*Picea abies* [L.] Karst.). **[The results of provenance trials with Spruce of different origins.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (153–200). 33 refs. [G.f.]

Summarizes the data obtained from trials begun by Engler in 1899. Height was taken as the principal criterion for measuring differential growth, and it was found that differences in height reached their maximum between the 10th and 25th years. Variation was small in Spruces from provenances at low altitudes, but considerable in trees of alpine or pre-alpine provenances. Every stand of Spruce contains some individuals with a marked capacity for adapting themselves to other conditions, and the expediency of making use of seed of a given provenance depends largely on the proportion of such adaptable individuals existing in the stand. The difference between individuals in the same stand may be greater and may be of more importance to the behaviour of their progeny than differences of as much as 500 m. in altitude between one seed source and another. The lay-out and management of such trials is discussed at length.

220. Åkerhielm, L. Tallen på svältmarkerna. **[Pine on poor heathlands.]** *Svenska SkogsvFören. Tidskr.* 47 (3), 1949 (147–66). [Sw.sw.]

Stands of Pine established during the 19th century on heathlands near the west coast grew well at first, but after some decades their rate of growth declined and many trees died. Some of the failures may have been due to seed of unsuitable provenance, but in many cases imported seed has given excellent results, while stands from local seeds have failed. The decline in growth rate is attributed rather to soil and the wet climate. Young Pine, on sites good enough for Oak and Beech, grows too fast in the early years. Higher, poorer sites on the west coast produce better Pine, while the better sites are more suitable for Spruce. Native seed collected during 1945–6 and 2-year-old plants raised from this seed all showed a uniform type.

221. Isaac, L. A. **Better Douglas Fir forests from better seed.** University of Washington Press, Seattle. 1949. pp. 64 + 13 photos, and map in pocket. 65 refs. Price $1.00.

Reviews and summarizes existing information on geographical races and seed sources for Douglas Fir in the U.S.A. and suggests rules for seed collection.

222. Heilmann, A. Proveniensspørgsmålet og frøforsyningen for de nordvestamerikanske træarter med særligt henblik på Douglas. **[The provenance question and seed supplies of north-west American tree species, with special reference to Douglas Fir.]** *Dansk Skovfören. Tidsskr.* 35 (8), 1950 (430–56). [Dan.]

The author, who spent some months in 1949–50 in the Pacific Northwest, with the aim of finding suitable sources and establishing a guaranteed

supply of Douglas Fir seed for importation into Denmark, examines such data as are available on the climate and soils of the region but finds that precise knowledge of local conditions (within the great range of conditions under which this species and its variations occur) is quite inadequate for anything more than a vague indication of the area in which suitable seed sources might be looked for, viz. the E. side of the coastal range and the W. side of the Cascade Mts. in Washington and northernmost Oregon, and possibly the coast region N. of Vancouver. So far, Danish provenance trials have pointed to Louella, Wash., as the only safe source, but even this needs closer study since the area of collection covers several thousand acres. Results at Wind River [cf. Munger and Morris, *For. Abstr.* 5 (67)] suggest that the Darrington and Granite Falls provenances should be worth trying. There is a prospect that the Pacific Northwest Forest Experiment Station and the University of Washington may collaborate in further studies of the influence of climate and soil on the growth of Douglas Fir, partly by exact description of the locality factors of seed sources and partly by trials in different climatic regions, and that the Danish State Forest Research Branch may take part in provenance trials under this scheme.

223. TULSTRUP, N. P. Danske rødelprovenienser: foreløbige iagttagelser ved Statens Forstlige Forsøgsvæsen. **[Danish provenances of *Alnus glutinosa*: preliminary observations by the State Forest Research Branch.]** *Dansk Skovfören. Tidsskr.* 34 (12), 1949 (529–32). [Dan.]

Denmark's requirements of *A. glutinosa* seed are more than satisfied by domestic supplies, partly from stands approved by the Seed Committee of the Danish Forestry Association, which gave a seed harvest of *ca.* 300 kg. in 1948, and partly (quantity unknown) from other stands.

Experience in several nurseries has suggested that various Danish provenances of this species differ in vigour, and this is confirmed by provenance trials which the research branch of the forest service has in progress. Data on height and remarks on stem form and health, from the first measurement in 1949, are tabulated for 10- to 12-year-old trees in a trial of various provenances at Haunø-Lounkær. It is mentioned that in this area a plot of *A. cordata* has completely succumbed to frost in the course of a few years, beginning in 1941.

224. TULSTRUP, N. P. Proveniensforsøg med nogle vigtige udenlandske bøgeracer: foreløbige iagttagelser ved Statens Forstlige Forsøgsvæsen. **[Provenance trials of some important foreign races of Beech: preliminary observations by the State Forest Research Branch.]** *Dansk Skovfören. Tidsskr.* 35 (3), 1950 (166–78). [Dan.]

Gives data for 11- to 13-year-old trees, from trials in 3 localities, of the following provenances: Holland (Middachten), Belgium (Forêt de Soignes), Switzerland (Sihlwald and Adlisberg), Slovakia (Tal Štiavnica) and N.E. Germany (Stubnitz, on Rügen). So far, results agree on the whole with what had been expected from the parent stands. The Swiss, Belgian and possibly the Dutch provenances show the best height growth. Straightness of stem is best in the Swiss and Slovakian provenances, but these show more forking than Forêt de Soignes and Middachten, and the Slovakian provenance had the worst forking of all. Taking all three criteria into account, Sihlwald has the highest and Stubnitz the lowest rating. Flushing dates were noted at one locality and gave the following order of flushing (earliest to latest): Tal Štiavnica, Adlisberg, Sihlwald, Stubnitz, Forêt de Soignes. One of the trials consisted of plants left in the nursery till the end of their 6th growing season, when they were graded for both height and form before planting out. At 11 years of age most of these still retain their original grading for height growth and straightness. No clear conclusion was possible in the case of forking, though the tallest and straightest—the two Swiss provenances—are here the least forked. Results with the Sihlwald Beech suggest that it might be worth while to try planting selected, large, well formed stock of good provenance at a wide spacing.

225. BURGER, H. Einfluss der Herkunft des Samens auf die Eigenschaften forstlicher Holzgewächse. VI Mitteilung. Die Buche. **[The influence of seed source on the characteristics of forest trees. Part VI. Beech.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (2), 1948 (287–326 + 12 photos). 27 refs. [G.g.f.]

Gives results of provenance trials with Beech seed from various parts of Switzerland. The previous articles in this series, dealing with other species, appeared in and before 1935. It was found that height growth, stem form, and date of flushing and of leaf fall, all varied with provenance.

226. BURGER, H. Einfluss der Herkunft des Samens auf die Eigenschaften der forstlichen Holzgewächse. VII. Mitteilung. Die Eiche. **[The influence of seed source on the characteristics of forest trees. Part VII. Oak.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (59–90). 28 refs. [G.g.f.]

Gives results of provenance trials with Pedunculate and Sessile Oak from various sources in Switzerland and abroad. In general, Sessile Oak flushed earlier than Pedunculate Oak of the same provenance, and was consequently more susceptible to damage by late frosts. On any given site, Pedunculate Oak was found to grow more rapidly than Sessile during the early years, but at 20–30 years of age the two species were almost equal. Young Pedunculate Oaks seem regularly to form more Lammas shoots and to suffer more from rust than Sessile Oaks. Sessile Oaks lose their leaves earlier and therefore suffer less damage from early snowfalls than do Pedunculate Oaks.

Pedunculate Oaks from Jugoslavia flushed earlier, were more subject to fungus diseases, and lost their leaves earlier than native Swiss strains. Strong evidence was obtained of the heritability of good and of poor form.

227. DAKOV, M. P. Vlijanie geografičeskogo proishoždenija želudeĭ na rost i žiznestoĭkostj duba. **[Influence of the geographical origin of acorns on**

the growth of Oak and its resistance to injuries.] *Lesn. Hoz.* 3 (3), 1950 (25–9). [Russ.russ.]

In the trial Oak plantations raised by Ogievskiĭ in the Tula 'Zaseki' [cf. *For. Abstr.* 11 (No. 292)] the origins of seed used were (1) local, (2) Voronezh, and (3) Kazan. At 37 years of age, stands derived from (1) in all cases showed the best height and diameter growth; in those derived from dense patch ('nest') sowings the volume/ha. for (1) exceeded that for (2) and (3) by respectively 20 and 29%; in the line sowings the volume/ha. for (1) was *ca.* 5 times that for (2) and (3). The author also reports on a provenance trial made near Sophia, in Bulgaria, of Pedunculate Oak of local and E. Bulgarian origin. At 35 years, in 1946, the local strain showed considerably superior growth and form. The E. Bulgarian provenance was very crooked-stemmed, whereas stems of the local provenance were practically straight. The former was two weeks earlier in flushing and therefore suffered more than the latter from spring frosts. Results of the trials are given in tables and graphs.

228. MÜNCH, E. Beiträge zur Forstpflanzenzüchtung. Versuche einer Auslesezüchtung durch Einzelstamm-Absaaten bei Fichte. Weitere Beiträge zur Forstpflanzenzüchtung aus dem wissenschaftlichen Nachlass von Univ.-Prof. Dr. Ernst Münch. **[Contributions to forest tree breeding. Selection trials of progeny of individual Spruce trees. Further contributions to forest tree breeding from the papers of the late Dr. E. Münch.]** Bayerischer Landwirtschaftsverlag G.m.b.H., Munich. 1949. pp. 116. [G.] Edited by B. Huber. Price [£2. 0*s.* 0*d.*].

The book presents the results of work on the selective breeding of Spruce carried out by Münch, from 1923 until his death. The progeny of about 40 selected parent trees in the Tharandter Wald was tested over many years, in order to discover whether future growth rates can be forecast from early growth habits. The experiments and results are reported in detail. The general conclusion of Münch is that early growth is not always a pointer to later development, because, although growth characteristics are hereditary, many and complex external factors are involved. Some of these factors were studied and are discussed in detail. Among them are:—(1) root necrosis, susceptibility to which may be hereditary; (2) frost damage, susceptibility to which is also hereditary, being closely connected with time of flushing; (3) effects of transplanting—a reversal of growth rates often follows the transplanting of seedlings; (4) soil—stands grown on arable soil were much more homogeneous than those grown on forest soils. So far as hereditary factors themselves are concerned, when there is no control of pollination the mother tree cannot be relied upon to produce progeny of the same genotype each year. Variable results were obtained in testing early- and late-flushing strains, but, on the whole, the trend seemed fairly constant. Early selection and classification of seedlings according to size, resulted, in fact, in a classification according to early- and late-flushing characteristics, the smallest seedlings flushing early, and the largest flushing late. An improvement in the genotype is therefore possible by this method. Experiments with Spruce, Pine, Aspen and Beech strains of different provenance are also reported. The methods as a whole and results are discussed in a postscript. [Cf. *For. Abstr.* 12 (Nos. 1764–5, 2844)].

232.13. *Trials of Hybrids and Other Products of Tree Breeding*

See Nos. 74, 83–4, 428, 430.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 274, 285, 328.

229. **Plantation establishment.** *Rep. For. Timb. Bur. Aust. 1949* [? 1950] (15).

After 6 years in the field, the mean heights of cultivated and uncultivated *Pinus radiata* were 17·09 and 14·45 ft. respectively, and the cultivated rows still had a greater rate of increment than that of the uncultivated. Remeasurement of an experiment to test methods of soil preparation confirmed the benefits of planting in ploughed lines. Trees planted in holes on unploughed lines averaged 5 ft. shorter than those planted in a 3-furrow line, while those planted in 2-furrow lines are within 8 in. in height of those in the 3-furrow lines.

230. WIJK, C. L. VAN. Mechanische grondbewerking bij bebossing van grasterreinen op Muna. **[Mechanical cultivation of grass [lalang] plains at Muna, for afforestation.]** *Tectona* 40 (3/4), 1950 (346–58). [Du.e.jav.]

Experiments have shown that *Imperata cylindrica* can be eradicated at a reasonable cost in regions that have a pronounced dry period of 3–4 months. The treatment, which should be effected early in the dry season, consisted in ploughing with an R4 tractor and a Davis disk plough, followed by disk harrowing to break up the clods. After 2 months' sun scorching, the *Imperata* rhizomes were dead, and a leguminous crop (*Calopogonium mucunoides*) was then sown. The *Imperata* had a slight revival after the *Calopogonium* died down, but it was quickly stifled as soon as the seed of the latter germinated. Costs are estimated at *Fl.*33·5/ha. for ploughing and *Fl.*16·5/ha for harrowing. It is impossible to plough Teak soils except in dry weather.

231. KOLČIN, A. I. Uskorennaja snegosgonka i ee primenenie. **[Accelerated snow-melting and its application.]** *Lesn. Hoz.* 3 (3), 1950 (69–73). [Russ.]

Refers to Russian experiments made in the 1930's in which snow-melting was hastened by broadcasting dark-coloured, cheap materials (e.g. ashes, soot, road dust, peat dust; the darker the better) on the surface of the snow, and urges the value of this treatment for gaining time in agricultural and silvicultural work. The quantity of material required is 100–200 kg./ha. To improve the absorption of snow-water and thus reduce erosion in fields etc. strips 1–2 m. wide may be so treated, with untreated strips 10–15 m. wide in between.

232.3. Seed, Nursery Practice, Direct Sowing

232. SENNI, L. Semina e prima coltura degli eucalitti. **[Sowing and nursery practice for Eucalypts.]** *Monti e Boschi* 2 (4), 1951 (180–1). [It.]

Describes briefly the methods commonly used in Italy.

232.31. *Seed*

233. WRABER, M. Nova pota gozdne semenarske službe. **[New ideas in forest seed procurement.]** *Gozd. Vestn.* 9 (1/2), 1951 (3–14). 6 refs. [Sloven. serb.f.]

Discusses the genetical and ecological principles of an efficient forest seed service. Slovenia has been divided into 7 forest seed regions and a number of forest seed stands have been set aside as a constant source of quality seeds.

234. SOLJANIK, I. O sakupljanju i jesenjoj setvi šumskog semena i njegovoj pripremi za proletnju setvu. **[Collection and autumn sowing of forest seed and its preparation for spring sowing.]** *Šum. List* 74 (7/8), 1950 (313–20). [Croat.]

Brief description of the main phases of work with forest seed, with tabulated times of flowering, ripening, and collecting, as well as number of seeds per kg., for 25 forest species, including some exotics, of importance in Jugoslavia. Another table gives germination data for stratified and non-stratified seeds of 20 of these species. A method of stratification in trenches (with sand or litter) is described, yielding results almost identical with those obtained by stratification in sand-filled boxes placed in cellars.

232.311. Seed Production (Seed Years, Seed Crops etc.)

See Nos. 144 *et seq.*, 191.

232.312. Seed Collection, Extraction and Grading

See also Nos. 221, 234, 241, 251.

235. MARKOVIĆ, L. O unapređenju i proširenju naših borovih šuma i njihovom racionalnom iskorišćavanju. **[Progressive treatment and extension of our Pine forests and their rational exploitation.]** *Šum. List* 74 (6), 1950 (252–8). 8 refs. [Croat.]

Geographical survey of the occurrence of Pine species (*P. nigra. P. sylvestris, P. peuce, P. leucodermis, P. mugo* var. *mughus, P. pinea,* and *P. halepensis*) in Jugoslavia. Past and current resin-tapping and seed-collection practices are described in some detail. These two questions were the objects of a special national conference (February, 1950) where resolutions were passed regarding improvements in resin tapping and processing, and the establishment of seed centres.

236. POURTET, J. Matériels pour faciliter la récolte des graines et l'élagage. **[Equipment to facilitate seed collection and pruning.]** *Rev. for. franç.* 1951 (6), (451–2+3 photos). [F.]

Notes (illustrated) on the 'Baumvelo' [cf. *For. Abstr.* 9 (No. 226); 11 (No. 2661)] and an expanding duralumin ladder of Swedish design.

237. DENK. Änderungen und Neuerungen zu den Geräten zum Zapfenpflücken am stehenden Stamm. **[Changes and innovations in equipment for gathering cones from standing trees.]** *Forst u. Holz* 6 (10), 1951 (138–40). [G.]

238. SCHWAB, F. Oogsten en eesten van damarzaad. **[Collection and kiln extraction of seed of Damar [*Agathis loranthifolia*?].]** *Tectona* 40 (3/4), 1950 (323–8). [Du.]

239. **[Maturation and extraction of *Pinus radiata* seed.]** *Rep. For. Timb. Bur. Aust. 1949* [? 1950] (14).

Cones had attained their full length by March. Colour change from green to brown occurred suddenly during September and the cones began to dry out at the end of September. Seed matured during March and April, before colour changed or loss of moisture began. The total weight of the seed did not bear a close relationship to the green-cone weight, and there appeared to be little variation in the weight of equal numbers of seed from each collection. Opened cones from a solar extractor were soaked in water for 24 hours and replaced in the extractor, when a further 5% of seed was obtained. Their germination % was only half that of seed from the first extraction.

240. LOZOVOĬ, A. A. Podgotovka k posevu semjan iljmovyh. **[Preparation of Ulmaceous seeds for sowing.]** *Lesn. Hoz.* 3 (4), 1950 (79). [Russ.]

If Elm seed is left in the samara it is almost impossible to separate filled from empty samaras, sowing can only be done by hand, it is difficult to secure a good covering of sufficiently moist earth, and the beds are therefore very patchy. Since 1932 the author has extracted the seed from freshly gathered samaras, spread in a thin layer and dried in the sun for 5–6 hr., by rubbing them through a wire screen (5–6 mm. mesh) and using an agricultural winnower to separate the good seed, of which the yield is 35–45% by weight, Cleaned seed has given a laboratory germination of 63–83% and a field germination of 60–75%. It can be sown with an agricultural drill, using 0·5 g./running metre. This method has been used in a nursery at the Hrenovaja Stancija, Voronezh Province, ever since 1936.

232.315. Seed Storage and Treatment

See also Nos. 234, 266, 276.

241. KRÉBES, G. Sber a zimovanie žalud'a. **[Collection and winter storage of acorns.]** *Pol'ana* 6 (7/8), 1950 (148–52). [Slovak.]

Detailed information and instructions, based mainly on personal experience in the State forests of Western Slovakia. About ½ of the acorn harvest, it is suggested, may be used for autumn sowing, the other half being stored over winter, and sown in spring (¾ in the forest, ¼ in nurseries). Collected sound acorns should be immediately stored for ripening, which may be effected either in the forest or, during wet weather, in a thatched open shed. The acorns are spread in a layer up to 10 cm. thick, and turned over at least daily, for 10–15 days. Thereafter they can be stored for the winter in layers up to 40 cm. thick, by several methods: (1) on the surface of forest soil, preferably on a northern slope, in 10–20 cm. layers, covered with dry leaves; (2) under (fresh and clean) slowly flowing water; (3) in a

dug-out covered with a thatched roof, the front and rear openings being closed with straw; (4) underground, below 80–100 cm. of earth, in alternate layers of sand and acorns, care being taken to provide for efficient drainage; (5) in conical heaps, covered with straw and 30–90 cm. of earth, and ventilated by a central shaft.

242. Sato, Y. **On the viability of *Populus* seeds.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (77–92). 22 refs. [Jap.jap.e.]

Seeds of *Populus sieboldii* were collected from 1938 to 1942, and those of *P. simonii* and *P. laurifolia* in 1939. Fresh seeds and seeds dried for 10 to 100 hr. at 40° C. were in each case stored in sealed paraffin paper, or air-tight bottles or tins, at (*a*) room temperature, (*b*) – 15° C. and (*c*) – 15° C. over a desiccating agent. A uniform temperature of 20–30° C. was found best for germination, and initial germination usually took 48 hr. for seeds germinated at 20° C. Germination of seed of *P. sieboldii* was 2% for seed collected in 1939 after 1,530 days' storage, 3% for seed collected in 1938 and 1941 and stored for 743 and 2,742 days respectively, and 81% for seed collected in 1940 and 1942 after 2,166 and 2,374 days' storage. Germination of *P. simonii* was 26% after 1,171 days, and that of *P. laurifolia* 0·3% after 1,202 days. There was little difference between the germinative energy of fresh and old seeds, which suggests that the seeds, like *Populus* cuttings, do not have a dormant period. A moisture content of under 6% of the dry weight of the seed is essential for longevity. Temperature of drying should be kept below 40°; seeds dried above 45° lose their viability at once. A constant storage temperature of below 0° is best for prolonging viability. Storage without O_2 does not appear to be important. The following treatments are recommended:—(1) reduction of moisture content to 6% by heating at temperatures below 40°, or by using a desiccating agent (equal parts of adsol and seed by weight); and (2) storage below 0° in air-tight bottles or tins. *From author's summary.*

243. Kjær, A. Opbevaringsforsøg med frø af lærk. **[Experiments on storing Larch seed.]** *Dansk Skovforen. Tidsskr.* 35 (2), 1950 (116–20). [Dan.]

Larch seeds dried to 8 and to 6% moisture content and kept in an air-tight container in an unwarmed but insulated room for 7 years, retained their viability, and would probably do so over a longer period. Seeds kept in an air-tight container, or in contact with the air, without previous drying, and others dried and then kept in contact with the air, rapidly lost their viability and all were dead after 6 years.

244. **[Storage and treatment of *Pinus pinaster* seed.]** *Rep. For. Timb. Bur. Aust. 1949* [? 1950] (16).

Experiments were made on chemical pre-treatment and cold storage of *P. pinaster* seed. Hot-water soaking diminished germination by two-thirds. Soaking in a 2% solution of KNO_3 for 3 days both accelerated and increased germination from 35 (controls) to 51%. Cold storage accelerated germination by 1–4 weeks compared with controls, and the longer the period of cold storage, up to 6 weeks, the higher was the germination %.

245. Moffett, A. A. **Pre-sowing treatment of Wattle seed.** *Rep. Wattle Res. S. Afr. 1950*, 1951 (32–4). 3 refs.

Detailed recommendations for hot-water treatment. Treated seed may be safely kept from one season to the next.

246. **[Insecticidal treatment of *Prosopis* seed and stratification of *Juniperus macropoda* seed.]** *For. Res. India Burma 1947–8*, 1950 (16–7).

Tests on seed of *Prosopis glandulosa* indicated that seeds treated with paradichlorbenzene or naphthalene could be stored for 3 years in sealed tins without much loss of germinative capacity.

Stratification of *Juniperus macropoda* seed for 2 months resulted in 10% germination for 1-year-old, and 20% for 2-year-old seed, compared with none for untreated controls. Germination was obtained within 14 days of sowing, after which the seed became dormant again.

247. Afanasjev, A. P. Uskorennaja stratifikacija semjan klena tatarskogo. **[Shorter stratification of *Acer tataricum* seed.]** *Lesn. Hoz.* 3 (3), 1950 (88). [Russ.]

The standard stratification period for seed of *A. tataricum* is 120–150 days. A case is quoted, however, of a lot of seed which by accident was not stratified until mid-January (1 part of seed to 3 parts of sand) and then stored in a warm room (temperature up to 22° C.), where by mid-February seed on the warmer side had produced sprouts up to 2·5 cm. long and those on the cooler side were just germinating. Attempts were made to retard further development by storage outdoors under snow, but this was a failure owing to freezing of the germinating seedlings. Seeing that time and money could be saved if the stratification period could be shortened, it is urged that further experiments be made to explore the possibilities suggested by the case quoted.

248. Podhorski, I. Kapilarno klijalo. **[Capillary germinating apparatus.]** *Šum. List* 74 (9/10), 1950 (384–7). [Croat.]

The apparatus (illustrated) consists essentially of a baseplate (wooden board + galvanized-iron sheet + 2 sheets of newsprint and 1 sheet of absorbent paper) and a wide-necked bottle which is filled with water and placed upside down on the absorbent paper. The width of the apparatus is usually 10–12 cm., the length 16–19 cm. Three varieties of the apparatus are described, one of which is suitable for determining germination of seeds that must be embedded in soil. All are under test at the Forest Research Institute, Zagreb.

232.32. *Plant Rearing. Nursery Practice*

See also Nos. 118–9, 182, 201, 231.

249. Staheĭko, F. G. Mehanizacija rabot v lesnyh pitomnikah. **[Mechanization in forest nurseries.]** *Lesn. Hoz.* 3 (3), 1950 (56–60). [Russ.]

Discusses, with diagrams, various lay-outs of nursery beds and spacings for seedling lines adapted to the machinery—tractors, ploughs and cultivators, seed drillers and plant-lifting machines—now coming into use in the U.S.S.R., noting that further modifications will be needed as new machines are devised.

232.323. Sowing and Covering

250. Soljanik, I. O planiranju i setvi šumskog semena u rasadnicima i na terenu. [**Planning for sowing of forest seed in nurseries and at site.**] *Šum. List* 74 (9/10), 1950 (341–6). 12 refs. [Croat.]

Contains tabulated results of the author's research, giving the following average data for 46 hardwood and 5 conifer species: number of seeds per kg. of pure seed; number of seeds to be sown per linear metre of furrow; depth of sowing; number of plants per linear metre 2 years after sowing; time of sowing; distance between rows in the bed. (The local figures for the number of seeds per kg., differing from those generally accepted, are: *Fraxinus americana* 30,500; *Acer dasycarpum* 4,000–5,000; *Abies pectinata* 20,500; *Fraxinus ornus* 35,000.) The weight, *T*, of seeds necessary per ha. of gross nursery area, is calculated from the formula

$$T = \frac{A \times B \times M}{N}$$

where *A* is the number of seeds per linear metre; *B*—number of rows per metre of width; *N*—number of seeds per kg.; *M*—the effective area (usually 7,500 sq. m. per ha.).

251. Špalek, V. Jak pěstovat topoly ze semen. [**How to raise Poplars from seed.**] *Sborn. čsl. Akad. zeměd.* 22 (3/5), 1950 (523–32). 3 refs. [Cz.russ.e.] C.G.B.

On the basis of his field, laboratory and nursery studies, some of which—mainly on *Populus tremula* and *P. alba*—are briefly described, the author recommends the following procedure:—Reconnoitre suitable mother trees in advance, making sure that ♂ trees are also present. Collect well developed ripe catkins as soon as the cotton begins to show, and lay them in a thin layer on a sieve (2 mm. mesh) to dry, preferably in the sun. Protect them from blowing away, but see that ventilation is adequate below and above the layer. When dry, rub through the sieve and mix with a suitable quantity of sand or fine peat for sowing. Sow on mud at the bottom of drills watered copiously before sowing, cover very lightly with fine soil, and keep the drills constantly wet for 3 weeks, thinning the seedlings, as soon as they are properly rooted, to at least 3 cm. apart. Soil texture in the seedbeds is of entirely secondary importance, the one essential being to maintain wet conditions while the radicle has not begun to elongate and the seedlings are anchored only by the ring of root-hairs round the collar—a state lasting some 14 days. After 3 weeks they need no more care than that given to seedling beds of other species.

252. Němec, A. Pestovanie osiky zo semena. [**Raising Aspen from seed.**] *Pol'ana* 6 (12), 1950 (267–9). [Slovak.]

The author raised *ca.* 50,000 Aspen plants from seed in 1950, an imposing number in view of the high susceptibility of the seedlings to injuries. Five different methods of soil preparation, sowing, and tending, are described. The most important single factor is soil moisture. Best results were obtained with the following method. The experimental plot was well manured in the autumn with stable manure mixed with ashes, using a layer of manure 6 cm. thick, and loosening the soil to a depth of 25 cm. Six days later, a 3-cm. layer of ashes was spread on the soil, and thoroughly mixed with clay, using iron rakes. Next May, the plot was weeded, and seeds collected on 2 May were sown on the 29th in furrows 4 cm. wide and 1 cm. deep. The plant % was 71. After sowing, the beds were thoroughly watered. Eight hours later the green of the leaves was already perceptible, and after 28 days the Aspen growth became so thick as to necessitate thinning. The plot was watered every morning, care being taken to use a very fine spray. During growth, the seedlings were 6 times sprayed with $CuSO_4$ solution. Thirty days after sowing, the seedlings were 3·5–5·5 cm. high and the roots well developed, their length being 7–13 cm. Forty-five days after sowing the plants were 4–19 cm. high with very extensive root systems. The last watering was done on 10 July.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also No. 228.

253. Tulstrup, N. P. Sortering af rødgranplanter: foreløbige iagttagelser ved Statens Forstlige Forsøgsvæsen. [**Grading of Norway Spruce nursery stock: preliminary observations by the State Forest Research Branch.**] *Dansk Skovforen. Tidsskr.* 35 (1), 1950 (62–7). [Dan.]

In spring 1944 a batch [number unspecified] of 2 + 0 Spruce was divided into two lots—(1) transplanted into separate beds after grading as small, medium and large; (2) ungraded control. On lifting as 2 + 2 stock in spring 1946, (2) was divided into two sub-lots—(*a*) graded as small, medium and large, and (*b*) ungraded. No significant difference in mortality had occurred in the nursery between the various groups. The whole population was then planted out in two separate forests, Kield and Fovslet. Results from inspections in spring 1949 at Kield and autumn 1949 at Fovslet are given in a table and graph. Preliminary conclusions are that: (i) No genetic selection results from size-grading of 2 + 0 stock, since any differences between the groups gradually diminished in the forest, and at Fovslet had quite disappeared by 1949. (ii) Grading of 2 + 2 stock does appear to select plants with genetic differences in (at least early) growth. In 1949 the height difference between the stock graded as small and large had persisted. (iii) The completely ungraded group (2*b*) had a mean height in 1949 equal to (Kield) or rather lower than (Fovslet) the mean for the groups graded as small and large at 2 + 2. Omission of grading appears to involve the risk that 40% of the plants will be less than 50 cm. high 3 years after planting out, whereas the corresponding figure for stock graded as small at 2 + 0 is only 28%, which suggests that the effect is largely the result of suppression of small transplants by large ones in the nursery. (iv) Grading at 2 + 0 can be recommended both for the practical convenience of having transplant beds as even in growth as possible, and for the advantage of this to seedlings still capable of good development. The longer-term effects of grading at 2 + 2 cannot be

foreseen, but the increased cost and the obviously better growth of the top-grade stock should justify a better price for it.

232.325. Tending (in both Seedbeds and Transplant Beds)

254. KOVALIN, D. T., and VOEVODA, D. K. Doždevaljnye ustanovki dlja vodopoliva v pitomnikah. **[Sprinkling equipment for watering nurseries.]** *Lesn. Hoz.* 3 (3), 1950 (50–5). [Russ.]

Gives constructional and operational details, illustrated by diagrams and tables, of two standard Russian types (KDU–41 and KDU–47) of sprinkling equipment, with notes on suitable centrifugal pumps and water-distributing pipe systems for supplying them with water. Includes also some brief notes on watering rates for different textural classes of soil and different woody species classed in 3 groups according to their water requirements at various stages of their first year of life in the nursery.

255. STOECKELER, J. H. **Proper watering in the nursery produces drought-hardy Jack Pine.** *Tech. Note Lake St. For. Exp. Sta.* No. 348, 1951. p. 1.

Beds of 2nd-year Jack Pine were, during the 4 months June–Sept., given no, infrequent, moderate, and frequent watering, a total of 0, 2·25, 4·75 and 7·00 in. respectively in addition to the natural rainfall, 15·11 in. The stock was lifted in the autumn, transplanted in the spring and subjected to controlled drought conditions that midsummer. Survival was best for the moderately and infrequently watered seedlings.

256. FARRER, R. P. **The use of selective herbicides in forestry in general, and in nursery work in particular.** *Emp. For. Rev.* 30 (1), 1951 (66–71). 23 refs.

Reviews work in the U.S.A. and Great Britain and tabulates data on the effect of a number of herbicides (*a*) on 23 common British weed species, (*b*) on various conifer seedlings. It is concluded that in nursery work the economy effected by the use of some herbicides with some tree species has already been proved: 0·2% Na M.C.P.A. (sodium 2-methyl-4-chlorophenoxyacetic acid) can probably be used on seedbeds of Sitka Spruce and Scots Pine, but if control of all weeds is to be effected by spraying, it would be necessary to use some other substance in addition, since there are a number of weeds that resist it. On the whole, Pines seem particularly resistant to herbicides, Spruces rather less so, and Larches least. The time of application is very important and should be thoroughly investigated, especially the pre-emergence method. The use of oils looks particularly promising in regard to *Poa annua*, which is very resistant to most chemical herbicides.

257. TULSTRUP, N. P. Emner fra planteskoledriften: uddrag af drøftelser ved Nordisk Skovunions planteskolemøde i Norge 1949. **[Nursery practice: summary of discussions at the Scandinavian Forestry Union's nursery meeting in Norway, 1949.]** *Dansk Skovforen. Tidsskr.* 34 (12), 1949 (533–42). [Dan.]

Mechanization was the chief feature at this meeting held at Sønsterud nursery where, owing to post-war labour shortage, operations have been largely mechanized. Discussions are reported under the headings sowing, weed control, sorting and grading of seedling stock, transplanting (including a demonstration of the 'Holland Transplanter' made at Holland, Michigan), soil problems, and storage, packing and dispatch of transplants. Mention is made of trials at Sønsterud in which weeds have been controlled, with little or no damage to transplants of Norway Spruce, by spraying *ca.* 8 times during the summer with Esso 'White Spirit' applied each time at 750 litres/ha., using a motor sprayer. The oil is dear and costs are not much less than for manual weeding, but the shortage of labour makes the method worth while. It is not, however, considered safe on seedbeds. In Denmark, Shell 'Weed Killer' has been found to injure Spruce in seedbeds but not 2+1 Norway Spruce or 1+1 Scots Pine, in which sprayings in late summer, using 750 litres/ha., controlled weeds. This liquid is also considered too dear for extensive use at present. Danish trials have also included dinitrobutyl phenol in quantities up to 1,000 litres/ha. without injury to 1 + 0 Silver Fir, though weeds and 2 + 1 Norway Spruce were killed.

258. NYHOLM, I. Anvendelse af flammekaster og højtraffinerede petroleumsnaftaer til ukrudtsbekæmpelse i planteskolerne. **[Use of flamethrowers and highly refined petroleum oils for weed control in nurseries.]** *Dansk Skovforen. Tidsskr.* 35 (10), 1950 (528–36). [Dan.]

Describes trials made in 1949 at the central nursery of the Hedeselskab. (1) Conifer seedbeds, in which sowings had been made from 10 to 20 May, were weeded *ca.* 10 days later with a 23-litre flamethrower carried on a shoulder-strap, and again after a further 5 days, just before seedling emergence began. No damage to the seedling crop occurred and the need for the first hand-weeding was eliminated. It took one man-hour to treat 200 m. of seedbed, whereas the average performance for the first hand-weeding is reckoned to be 9 m. of seedbed per man-hour. In the author's opinion the flamethrower will become indispensable for this purpose in Danish nurseries. (2) Spraying with Sovasol No. 5, using a back-packing sprayer, was tried for post-emergence weeding. Preliminary tests showed the minimum effective quantity of spray to be 400 litres/ha., and this was used throughout the trials. The first treatment was made in warm sunny weather; the oil evaporated almost at once on contact with plants or soil; and all weeds had been killed a week later. In *Picea abies* (1 + 0, 2 + 0), *P. glauca* (1 + 0, 2 + 0, 2 + 2), *P. sitchensis* (1 + 0, 2 + 0), *Pinus mugo* (1 + 0, 2 + 0), *P. sylvestris* (1 + 0, 2 + 0, 1 + 1), *P. contorta* and *P.c.* var. *latifolia* (1 + 0), *P. rigida* (1 + 0) and *P. nigra* var. *austriaca* (1 + 0) the % of seedlings killed or damaged was insignificant or none. *Larix* and *Tsuga* seedlings (1 + 0) were badly damaged. In *Pseudotsuga taxifolia* 8% were killed. When a second spraying became necessary the weather was cool and overcast. Only Pines and Spruces were sprayed. On this occasion the treatment killed 40% of the *P. abies*, though the other species were not

seriously damaged. The damage was not evident until 5 days after treatment, and there is clearly need for caution in interpreting the results of small-scale test sprayings. The damage in this case is thought to have resulted from the insufficiently rapid evaporation of the oil, with consequent penetration of the soil and poisoning of the seedlings. About 400 m. of bed can be sprayed by one man in 10 min., using 12 litres of oil. Filling and pumping would take *ca.* 15 min. It would be advantageous to use a tractor-mounted sprayer where possible, since by driving at a uniform speed the rate of application can be closely regulated, spray distribution is more even, and short periods of suitable weather can be exploited.

Research on weed control by sprays is in progress at the state plant breeding station, Krogerup, and under the forest research branch at Springforbi.

259. BROOKS, R. O. **Chemical weeding as applied to forest nursery practice.** *Pa. For. Wat.* 3 (2), 1951 (42–3, 47–8). 3 refs.

Good results were obtained with applications of Sovasol and Stanisol to nursery beds of White Pine. Light applications at a very early stage are recommended. [Cf. *For. Abstr.* 11 (No. 1445).]

260. DAY, M. W. **Use of mineral spirits for control of weeds in evergreen nurseries.** *Abstr.* in *Res. Rep. 6th. ann. Nth. Cent. Weed Control Conf.* 1949 (220). O.R.E.

Weeding costs were reduced *ca.* 65% by applying Stanisol with a boom spray to coniferous plants. A rate of 45–50 gal./acre was applied to 2-year-old seedlings and older transplants at pressures of 40–60 lb./sq. in. without injury to the stock. On first-year seedlings 35 gal./acre at 25 lb./sq. in. were used with equally good results. [Cf. *For. Abstr.* 11 (No. 3270).]

261. ELIASON, E. J. **Oil sprays control weeds in coniferous nurseries.** *Proc. Ntheast. Weed Control Conf.* 1950 (261–2). [New York State Conservation Department.] O.R.E.

[Cf. *For. Abstr.* 11 (No. 3270).] Grasses were almost completely eliminated in the New York State nurseries in 1949. By keeping to a low rate of application the susceptible species, Larch and Scots Pine, were safely treated. A light application of 20 gal./acre was given when the seedlings were first coming up and still had their seed coats. Heavier applications (only one in the case of 1-year-old Larch) were given later.

262. **Chemical weed control in conifer nurseries.** *Rep. Lake St. For. Exp. Sta. 1950* [1951] (13).

Trials of mineral oils were continued [cf. *For. Abstr.* 11 (No. 1445)]. Mineral spirits that have been stored for 1 or more years do more damage to trees than those freshly shipped in the current year.

MeBr, a toxic gas, applied as recommended by the manufacturers, reduced by $\frac{7}{8}$ the number of weeds 113 days after treatment. Being toxic to tree seeds, it must be aplied at least a week before sowing.

263. STOECKELER, J. H. **Killing weed seeds.** *Amer. Nurserym.* 93 (8), 1951 (10).

An experiment at Hugo Sauer Nursery, Rhinelander, Wis., proved that MeBr applied to nursery seedbeds before sowing, at a rate of 1 lb./100 sq. ft., gave complete freedom from weeds for at least 22 days, and almost complete freedom for 36 days, after treatment. A period of 7–10 days must intervene between treatment and sowing in order to allow the gas to escape from the soil. At the end of the season, the seedling stand was *ca.* 56% higher on treated than on untreated beds, which seems to indicate some fungicidal benefit of the treatment in addition to its herbicidal value. Details of application are given.

264. KEPHART, L. W. **Economic poisons in fertilizers.** U.S. Bureau of Plant Industry, Soils, and Agricultural Engineering. 1949. pp. 5.

Discusses the pros and cons of the use of 2,4-D fertilizer mixtures, which have hitherto been used almost exclusively on lawns and golf links.

232.327. Protection Measures in Nurseries

See also Nos. 416–8.

265. HVASS, J. Skyggehuse og persienner til dækning af frøbede. **[Permanent high lath shades and [rollable] lath screens for seedbeds.]** *Dansk Skovforen. Tidsskr.* 35 (5), 1950 (266–70). [Dan.]

The author's experience has persuaded him that lath screens or 'shade-houses' (permanent open-sided pole frameworks with a lath roof set high enough to allow of cultivation with horse-drawn implements or rotary cultivators) have not the disadvantages of covering with conifer brushwood or portable 'seedbed frames' with a lath or netting top on which brushwood or moss can be laid, and in the long run they are perhaps more economical. The 'seedbed frames', in particular, appear to attract mice and a beetle, *Bembidion lampros*, which eats the tops of young conifer seedlings. Brushwood can be troublesome to use and probably costs more in the end than is generally suspected. The 5 'shade-houses' built by the author are each 25 m. long (E.-W.) and 4 m. wide, and are close up to one another in a compact block, with southward-tilted roofs and a hanging lath screen along the edge of the southernmost for additional protection when required. Their expected life is *ca.* 20 years, which gives an annual cost per 'house' of *ca.* 25 *Kr.* All *Abies* sowings have been made in the 'houses' with nothing but good results. Douglas Fir, Sitka Spruce, *Chamaecyparis*, *Tsuga*, Larch, Beech and *Robinia* have also done well in them. In the 4 seasons since the older houses were built, no frost damage has occurred, even to *Robinia*, which is regularly frozen back to half its height in open beds. The ordinary rollable lath screens on low supports are satisfactory for all the usual tree species grown, but are less convenient, as they have to be rolled back for cultivation, weeding etc. Both the rollable screens and the roofs of the 'shade houses' have their laths separated by openings of the same width, i.e. giving *ca.* 50% of full light.

266. ALPHEN DE VEER, E. J. VAN, and LUNEL, F. A. V. Kweekproeven met *Intsia palembanica* Miq. en *Intsia bijuga* O. Ktze. **[Experiments in raising *I. palembanica* and *I. bijuga* [from seed].]** *Tectona* 40 (3/4), 1950 (336–45). [Du.du.e.jav.]

In recent tests with seed of *I. palembanica* at Bogor, germinative capacity was about the same in full light

as in darkened beds where the sunlight was permitted during one hour in the early morning, but the plant % was notably greater in the darkened beds (97·5) than in the full light (72·5). After 13 months, moreover, the height of plants in the former averaged 14 cm. more.

Germination was much accelerated by filing through the seed coat at the end opposite the hilum, starting in 11 days compared with 2 months for untreated seeds.

Experimental plots were started at Bogor, using filed seed of both species of *Intsia*, sown in full sunlight (*a*) in *Imperata cylindrica* and (*b*) between rows of the fast growing, green-manure crop *Calliandra tetragona*. At 11 months, both species were developing much better on (*b*) than on (*a*).

232.328. Vegetative Propagation.

See also Nos. 182, 329.

267. McClure, F. A., and Durand, F. M. **Propagation studies [with Bamboos].** *Rep. fed. exp. Sta. Puerto Rico* 1950 (27–8).

Briefly reports on experiments in propagating Bamboos by layers from mounded stumps, whole culm cuttings, rhizome cuttings, and branch cuttings, in several media. [Cf. *For. Abstr.* 13 (No. 343).]

268. **Vegetative reproduction of Radiata Pine.** *Rep. For. Timb. Bur. Aust. 1949* [? 1950] (13–4).

[For earlier experiments see *For. Abstr.* 11 (No. 2522).] This year's experiments gave rather different results. Stock raised in tubes 8 in. long did better than that raised in 6-in. tubes. The best root development, and in most cases a higher strike, followed the use of nursery compost as a tube filling. Cuttings taken between January and May gave reasonably good results. Strikes of up to 95% were obtained from 6-in. cuttings set 4 in. in the tube.

Further tests were carried out with cuttings from older trees (22 and 30 years old). They were found more difficult to strike than those from younger trees, but showed greater response to chemical treatment. Cuttings taken from the top of the crown are much easier to grow than those taken lower down, and this difference is accentuated by chemical treatment. A strike of 85% was obtained from 4-in. cuttings set 2½ in. in the tube, after soaking for 24 hours to a depth of 1½–2 in. in a solution of indoleacetic, indolebutyric, and naphthaleneacetic acids, vitamin B and sugar. Similar results were obtained by dipping in a proprietary preparation.

269. Toda, R., and Satoo, S. **The development of roots arising from callus tissues in young seedling cuttings of Pine: a preliminary report.** *J. Jap. For. Soc.* 30 (1/2), 1948 (19–25). 12 refs. [E.e.jap.]

Following initial success in rooting of one-year-old seedling cuttings of Modoomatsu (*Pinus densiflora* × *P. thunbergii*) the development of callus and of adventitious roots was studied microscopically in cuttings of (*a*) epicotylic shoots of Akamatsu (*P. densiflora*) seedlings, and (*b*) new shoots of Modoomatsu developed from decapitated epicotyls of 1-year-old seedlings. Roots appear to arise exogenously.

270. Toyama, S., and Yamaji, K. **Study of the Paper Mulberry [*Broussonetia kazinoki*]. (1) Propagation by cuttings.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 41, 1949 (85–94). 4 refs. [Jap.jap.e.]

The following results were obtained from experiments in rooting cuttings in a thermostat, in a stove-heated greenhouse and in the nursery: (1) Optimum temperature for the bed was 23° C., and temperatures between 20° and 30° are suitable in practice. (2) Rooting was most rapid at 23°, the rate was reduced by half below 15° and above 28°. (3) The highest rooting % was obtained when the diameter of the cutting at base was from 4 to 8 mm. In practice, diameters of 5 to 15 mm. are suitable. (4) The proportion of successful stem to branch cuttings was 100 to 74. (5) The effect of growth substances (β-indole acetic acid, α-naphthalene acetic acid and phenyl acetic acid) was to some extent favourable, especially when cuttings were allowed to stand in an 0·008% solution of phenyl acetic acid for 24 hr. Their use is not always desirable. (6) Both soil and air should be kept moist. (7) When cuttings were propagated in winter in the greenhouse, the period of propagation was reduced. *From authors' summary.*

271. Veen, B. **Het vermeerderen van *Robinia pseudoacacia*. [The propagation of *R. pseudoacacia*.]** *Ned. Boschb.-Tijdschr.* 23 (6), 1951 (169–74). [Du.e.]

The results of propagating 2 strains of *R. pseudoacacia* by root cuttings are tabulated. Cuttings should, if sufficient material is available, be not thinner than 5 mm., although it is possible to propagate from cuttings 2 mm. in diameter. No definite results for the minimum length were obtained. Treatment with grafting wax appeared to have a bad effect. Cuttings gave better results when placed upright than horizontally.

272. Rovskiĭ, V. M., Ozolin. G. P., and Solovjeva, A. I. **Selekcija iljmov na ustoičivostj protiv gollandskoĭ bolezni. [Breeding for resistance to Dutch Elm disease.]** *Lesn. Hoz.* 3 (4), 1950 (43–5). [Russ.]

Refers to the near-immunity of *Ulmus parvifolia*, and to the desirability of propagating élite trees vegetatively by root cuttings. [Cf. *For. Abstr.* 12 (No. 2471).]

273. Lasschuit, J. A. **Het vormen van adventiefwortels bij *Pinus merkusii*. [Induced formation of adventitious roots on *P. merkusii*.]** *Tectona* 40 (3/4), 1950 (319–22). [Du.e.jav.]

Preliminary experiments (interrupted by the war) in layering *P. merkusii*, showed some success after 8 months in 7 out of 75 trees (6 years old).

232.33. *Formation of Stands by Direct Sowing*

See also Nos. 250, 328.

274. Dekatov, N. E. **Vybor mest dlja gnezd kuljtur v taežnoĭ zone. [Selection of spots for 'nest' sowings or plantings in the *taiga* zone.]** *Lesn. Hoz.* 3 (4), 1950 (50–3). [Russ.]

On large-scale clear fellings in this zone, Birch and Aspen often succeed Pine and Spruce. Aspen, in particular, is extremely liable to heart rot, and it is of interest to secure some proportion of conifers in the young crop. Isolated seedbearers are

liable to windthrow, and natural regeneration cannot be relied on because of the distance from the old, uncut stands. Direct sowing or planting in dense patches ('nests') has been successful, e.g. in Leningrad Province, but it is important to select spots that will ensure the maximum growth and survival with the minimum of soil preparation and weeding. On first-class *Oxalis* sites with fresh soils, the most favourable spots are those where slash has been burnt, and beside stumps. Direct-sowing trials showed that for the first 5–10 years Pine on burnt spots had 1½ times the height and diameter growth, and 3 times the air-dry weight, of Pine on unburnt spots under otherwise identical conditions. Similar results were obtained with Spruce and Larch, the latter showing even more striking differences between burnt and unburnt spots. The usual growth of *Epilobium angustifolium* on burns was generally not detrimental to Pine and Larch, and was definitely favourable to Spruce. It affords protection and keeps out serious competitors such as grasses. All 3 species showed better growth in the first 3 years on burnt sites without weeding than on unburnt, weeded sites. On burns of *ca.* 2 m. diameter the conifers are not suppressed by grass or Aspen suckers, and can be left untended for 10–12 years. The burn, however, must be hot enough in the first place to kill grass and suckers, and winter burning is of little use. No preliminary soil cultivation is needed, but, for sowing, a thick ash layer should be brushed aside, or germination will be poor.

The immediate vicinity of stumps, especially the ground between the root spurs, also offers favourable conditions as regards soil and absence of grass competition, and both natural regeneration and direct sowings of the 3 coniferous species have given better results here than in the open ground between. Larch and Spruce near stumps develop deeper root systems than in the open ground. Stumps infected by *Armillaria mellea* or *Fomes annosus* should of course be avoided, and in Spruce/Larch stands so infected, the risk of seedling infection will be present throughout the area. On moist to wet sites, 90% of the area will often be too wet and poorly aerated, and too subject to frost-heaving, for conifer sowings. On such sites it is useless to expect regularly spaced sowings to succeed, but on irregularly spaced small elevations, and near stumps, successful sowings may be made by merely scraping off the moss layer, sowing on the exposed litter, and raking the seed in.

275. RUDOLF, P. O. **Stand density and the development of young Jack Pine.** *J. For.* 49 (4), 1951 (254–5). 4 refs. [Lake States Forest Experiment Station.]

Experimental sowings at different densities were made in 1941 in Michigan. Inspection of the plots at 10 years old indicated that 1,500 trees/acre was about the optimum at this age and 800/acre the minimum acceptable stocking.

276. FOILES, M. W. **Results of seeding germinated Western White Pine seed.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 95, 1951. pp. 5. 4 refs.

In a series of experiments between 1948 and 1950, plots were laid out to study the effect of advance preparation of stratified seed (germinated versus non-germinated) and of protection from rodents in spring spot-sowings. The protected spots were covered with cone-shaped mesh screens. Results, which are tabulated, show that (1) initial stocking from germinated seed was no better than from ungerminated seed, and (2) screening seed spots from rodents resulted in significantly greater stocking. Spring sowing with germinated seed does not, therefore, eliminate the need for rodent control, and autumn sowing with rodent poisoning remains recommended practice. [Cf. *For. Abstr.* 10 (No. 208).]

277. **Direct seeding of Oak.** *Rep. Lake St. For. Exp. Sta. 1950* 1951 (13).

Northern Red Oak acorns were sown under an Oak overstorey on 3 typical sites. Results at the end of the first season were best (92%) under an open growth of brambles, intermediate (43%) under dense interrupted fern, and poorest (28%) on thin bluegrass sod. Protecting seed spots with conical wire screens improved results by 25%.

278. TANŠEK, J. Kako je G. U. Ruše na svoj način rešila problem podsetve gozdnega semenja. **[How [the Ruše Forest Administration?] found its own solution of the problem of sowing forest seed.]** *Gozd. Vestn.* 9 (1/2), 1951 (40–1). [Sloven.]

Describes a modification of V. Beltram's sowing tool [cf. *For. Abstr.* 12 (No. 2896)] adapted by the author to local conditions in Slovenia. It is claimed that only 1·75 kg. of Fir seed (wingless) were needed for 1 ha., while the usual figure for broadcast sowing is 50–70 kg./ha.

279. PANJUKOV, D. N. Novye sejalki dlja gnezdovyh posevov lesnyh kuljtur. **[New seed drills for 'nest' sowings of forest plantations.]** *Lesn. Hoz.* 3 (3), 1950 (61–3). [Russ.]

Mentions [without describing] some drillers invented or adapted for shelterbelt sowings, and describes two types designed at the Timirjazevskaja Seljskohczjaĭstvennaja Akademija: (1) A 'universal' type adaptable for direct sowings by Lysenko's 'nest' method and for forest, forest nursery or agricultural sowings. (2) A special 'forest' type for sowing acorns by Lysenko's 'nest' method.

Both types are similar in essentials: the feed tubes for the seed are actuated from the wheels of the driller, being given a reciprocating motion so that they simultaneously keep the seed in the hopper in motion and feed a regulated supply to the drill nozzles, continuously (for line sowings) or intermittently (for 'nests' and patches) according to the gearing used. This mechanism is illustrated diagrammatically. Both machines are said to have done well in tests [no performance figures given].

232.4. Formation of Stands by Planting

See also Nos. 118–9, 253, 274.

280. WIJK, C. L. VAN. Enkele aantekeningen over de verjonging van djelutung (*Dyera lowii* Hook.f.). **[Some notes on artificial regeneration of Jelutong (*D. lowii*).]** *Tectona* 40 (2), 1950 (167–73). [Du.e.]

D. lowii occurs naturally in swampy forests in Sumatra and Borneo, where the clay subsoil is covered by 60–80 in. of water-saturated peat. Satisfactory survival and growth were obtained by planting stumped 2- to 3-year-old wildings in narrow furrows cut in the peat at intervals of 12–15 yards. After 2 years the canopy should be thinned above the young plants and the furrows widened. Average height at 3 years was 6½ ft. It is suggested that better results might be obtained by planting on ridges rather than in furrows, as prolonged contact with the acid peat water harms the young plants.

281. BARNARD, R. C. ***Eucalyptus robusta* Sm. planting trials.** *Malay. Forester* 14 (1), 1951 (38–40).

Stumped seedlings of *Eucalyptus robusta* gave poor survival, whereas both tubed and bare-rooted nursery seedlings, and seedlings lifted from seed-boxes with 2 × 2 × 4 in. of soil and roots attached, gave excellent survival (83–100%) and very rapid growth when planted in small cultivated patches at 4,000 ft. altitude in Malaya during rainy weather. The box-grown seedlings, when notch-planted, gave excellent survival but slower growth. Entire, bare-rooted nursery seedlings 9–18 in. tall are the most economic planting stock under these conditions. [Cf. *For. Abstr.* 13 (Nos. 196–7).]

282. BELTRAM, V. Racionalizacija pogozdovanja. **[The rationalization of afforestation.]** *Gozd. Vestn.* 8 (9/10), 1950 (275–80). [Sloven.croat.f.]

Different planting tools are described and discussed.

283. POURTET, J. La mécanisation des plantations: l'ouverture des potets. **[The mechanization of planting: digging planting holes.]** *Rev. for. franç.* 1951 (4), (303–4). [F.]

A further note on the Bungartz hole-digger [cf. *For. Abstr.* 12 (No. 1917)], and a comparison of its performance with that of the Collet cultivator-cum-auger ('Polyculteur à tarière Collet') which will dig 160 holes per hour in sandy soil.

284. KAWADA, M., and KANAYA, Y. **The planting distance of Akamatsu [*Pinus densiflora*] and Karamatsu [*Larix leptolepis*] and its effect on stand development.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 41, 1949 (29–62, 95–239). [Jap.e.]

Observations were made between 1904 and 1943 and are continuing, in even-aged plantations of Pine and Larch on 6 sample plots of each, with different spacings. Thinnings in each set were done concurrently, 7 times in the Pine and 5 times in the Larch during the period. The relation between diameter and height was found to be very close for all plots, that between diameter and crown spread rather less so, and that between diameter and clear length poor especially for Pine. Vol./ha. (1) the final volume remaining in 1943 was larger for Pine and smaller for Larch in the more closely planted stands; (2) the total yield showed similar results; and (3) average tree volume for both species, but more especially for Larch, was larger in the less closely spaced plots. The following results were obtained for the effect of planting density on tree development: (1) A close correlation between density of planting and mean diameter, the latter being higher on the less closely planted plots. (2) For Pine the mean height was greater on the more, and for Larch on the less closely planted stands. (3) For Pine the mean clear length was greater in the closer plantations, but results were less conclusive for Larch. (4) The mean crown spread was wider in the more open stands. Results are shown in numerous tables and graphs with English legends.

285. **Coastal Casuarina plantations.** *Rep. For. Dep. Mauritius 1949*, 1951 (11).

The usual spacing of Casuarina in the *pas géométrique* (coastal strip) in Mauritius varies from 7½ × 7½ to 10 × 10 ft., which permits of the cultivation of maize or vegetable crops for a number of years. Experiments are now being made with closer spacing (5 × 5 ft.), since it has been observed that in closely grown Casuarina, root fusion is a normal feature, and this assists in providing the stable anchorage necessary for trees at once growing in shallow soils and subject to cyclonic gales of intense force. The fodder grass *Stenotaphrum dimidiatum* grows well under comparatively heavy shade, and might take the place of the taungya crops grown at present.

286. MINCKLER, L. S. **Fall planting of Pine on upland soils of Southern Illinois.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 118, 1951. pp. 11.

Studies of spring and autumn planting of 1 + 0 *Pinus echinata* by different methods and in different types of ground cover. December planting gave low survival. October planting over a 2-year period on broom sedge (*Andropogon* sp.) was, however, successful, the mattock-slit method, without scalps, giving survival rates little lower than for spring planting. It proved the cheapest of the hand methods. Autumn planting with the Lowther planting machine gave only 45% survival; frost heaving caused most of the deaths. Results are tabulated.

232.5. Artificial Formation of Stands by Vegetative Propagation

See also No. 329.

287. LUKJJANOV, A. K. Kuljtury topoleĭ v poĭme reki Ural. **[Poplar plantations on the floodplain of the R. Ural.]** *Lesn. Hoz.* 3 (3), 1950 (85–6). [Russ.]

In planting Poplars on the floodplain of the R. Ural, account has to be taken of the spring floods, which may be 2 m. or more deep and last 1—2 months. Successful direct plantings of unrooted 'Balsam' Poplar cuttings are described, dating from 1948. The soil was worked in autumn 1947 to a depth of 25–28 cm. and harrowed twice after the 1948 spring floods subsided. Cuttings were planted at a spacing of 1 × 0·5 m. in May, and the soil was loosened to a depth of 6–8 cm.—an operation that must be done before the heavy clay-loam and silt soils have a chance to form a hard crust. Weeding and soil-loosening operations were repeated 4 times during the summer. By autumn the trees averaged 1·5 m. high. In mid-May 1949 they were cut back to stump, the shoots being used to make cuttings for a further plantation. Cutting back cannot be done earlier, owing to the floods. The soil was cultivated once more, and weeding and loosening followed at

the end of May and in mid-June. By autumn a closed stand had been formed in which the best stems were over 4 m. tall, with a butt diameter of 6 cm. In the second autumn singling can be done where necessary, and the shoots so removed used for cuttings on fresh areas.

233. *Afforestation*

See also Nos. 220, 230, 282, 859–62, 881.

288. Memoria explicativa de los trabajos realizados hasta la fecha. **[Explanatory report of work accomplished up to date.]** Servicio Forestal de la Diputación Provincial de Madrid. 1950. pp. 20. [Span.]

Reforestation work achieved by this department from 1926 onwards.

289. **Reforestation in Japan.** *Rep. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 113, 1948. pp. 50.

Gives figures for reforestation and felling from 1930 to 1947 and particulars of reforestation plans for periods of different lengths up to 1952.

290. Oxenham, J. R. **Reclamation of derelict land.** *Journal of the Institution of Municipal Engineers, London* 75 (3), 1948 (182–202). D.S.I.R.

Discusses the problem in the Midlands, machinery used in levelling and draining, and the establishment of trees where levelling is impracticable. Timber and ornamental species suitable as pioneers and for less severe conditions are listed. [Cf. *For. Abstr.* 12 (No. 297).]

291. Heuson, R. Bodenkultur der Zukunrt. **[Soil cultivation of the future.]** Siebeneicher Verlag, Berlin. 2nd ed., 1947. pp. 95 + 62 photos. [G.] Price [11*s.* 11*d.*]

[Cf. *For. Abstr.* 1 (15).] Substantially the same as the first edition, but with an additional chapter on N accumulators and nurse trees.

292. Kop, L. G. Een en ander over de groei van fijnspar en Douglas in Drente. **[On the growth of Norway Spruce and Douglas Fir in Drente.]** *Ned. Boschb.-Tijdschr.* 23 (3), 1951 (75–9). 4 refs. [Du.e.]

Afforestation on the heaths of Drente was started some 30 years ago. Measurements have been made on sample plots between 19 and 27 years old to determine the effect of different soil treatments. Groups 1 and 2 were given the same preliminary soil treatment—ploughing to a depth of 50 cm., dressing with K and P fertilizers, and disk harrowing; group 1 plots were grown under lupin for a year before planting and group 2 plots were given a dressing of compost about 10 years after planting. Group 3 plots were on old agricultural land. Average height and volume increment were better on group 2 and 3 than on group 1 plots. The difference was far more evident for Douglas Fir than for Spruce. It seems possible that the favourable results of compost treatment are largely related to moisture, because stands which had not been dressed with compost, but on which moisture conditions were favourable, also showed good growth.

293. Žukov, A. B. Agrotehnika vyraščivanija dubovyh nasaždenii v Stalingradskoi, Astrahanskoi i Rostovskoi oblastjah. **[Agricultural technique in raising Oak stands in Stalingrad, Astrakhan and Rostov Provinces.]** *Abstr.* in *Lesn. Hoz.* 3 (4), 1950 (16–7). 1 ref. [Russ.]

A conference paper dealing chiefly with methods of improving dark to light chestnut soils of medium alkalinity and complexes of these soils with alkali soils proper, sufficiently for Oak shelterbelt establishment. Two methods are briefly described: (1) Antipov-Karataev's, which consists in applying 2–3 metric tons/ha. of gypsum to the uncultivated soil in early spring, followed by ploughing to a depth of 27–30 cm. and loosening the compact horizon to a further 10–15 cm. with a subsoiler; applying and disking in another 2 tons/ha. of gypsum in the summer; and again ploughing and subsoil loosening to a total depth of 40–45 cm. in autumn. (2) Zemljanickii's, involving autumn ploughing and subsoil loosening to break up the compact horizon to a depth of 8–10 cm.; measures for snow retention in the winter; a clean fallow in the following summer; application of 3–5 tons/ha. of gypsum in late August and early September; ploughing and loosening the subsoil once more to a depth in the latter of 10–12 cm.; applying 2–3 tons/ha. of gypsum and harrowing in early spring, and sowing a green-manure crop to be ploughed in when it flowers. Both of these methods are worth full-scale trial.

In 1950 the amount of mycorrhizal soil to be put in each seed spot was standardized by the Board of Shelterbelt Forestry at 60 g. for chernozems and dark chestnut soils, and 90 g. for chestnut and light chestnut soils. It is further recommended that each seed spot should be given 7–8 g. of granulated superphosphate.

294. Ustinovskaja, L. T. Po lesnym massivam stepnoi zony USSR. **[Blocks of forest in the steppe zone of the Ukrainian S.S.R.]** *Priroda, Moskva* 39 (11), 1950 (25–36). 18 refs. [Russ.] A.P.B.

Reviews the history of forest (as contrasted with shelterbelt) plantations in this region, and gives a selection of mensurational data for some of the older ones to support the contention that the success of steppe plantations—even in the difficult conditions of the heavy clay-loam chernozems of plateaux—is a matter of correct choice of species, form of stand, and proper tending. Forest plantations should be made in the first place on the little used land along ravines and river valleys.

295. **Grassland afforestation.** *Rep. Conserv. For. Ceylon 1949*, 1951 (*G6*).

The most notable advances made in recent years in basic information and technique for afforestation of montane grasslands (*patanas*) in Ceylon are as follows:—(1) Change of spacing from 6 × 6 to 10 × 10 ft., thus effecting a saving of *ca.* 75% in costs of formation. (2) Group planting, using plots about 1 chain square of different species according to site conditions, e.g. groups of *Eucalyptus microcorys*, *E. saligna*, and *E. citriodora* for better soils and lower slopes, with *E. robusta* and *E. microcorys* for mid-slopes, and *E. robusta* nearly pure on the topmost ridges and other sites with poor soils. (3) Introduction of *Acacia decurrens* on the contour ridges left by strip weeding, to form an understorey

and permanently effective anti-erosion hedges. (4) Demonstration that planting holes 6 in. deep are as good as the 24-in. holes hitherto used in *patana* afforestation. Their use represents a saving of at least *Rs*.23/acre at current costs. [Cf. *For. Abstr.* 9 (Nos. 785, 1486).]

296. FERGUSON, J. H. A. *Pinus merkusii* in de laagvlakte. [***P. merkusii* in the lowlands.**] *Tectona* 39 (4), 1949 (329–33). [Du.du.e.]

Pinus merkusii has proved an adaptable species for the afforestation of fire-created grasslands (mainly *Imperata cylindrica*) in the hills and mountains of Sumatra and Java. Preliminary observations of 10-year-old experimental plantations on similar sites in the lowlands indicate that growth and survival are not markedly inferior to those at higher altitudes.

235. *Underplanting, Advance Planting etc. Nurses and Formation of Mixtures*

See also Nos. 188, 194.

297. **Underplanting.** *Rep. Sth. For. Exp. Sta. 1950* [1951] (4–6).

Underplanting tests have been made in poor upland hardwoods with Loblolly, Virginia, Slash, Shortleaf and Longleaf Pines and Eastern Red Cedar. Second-year survival has been good for both seedlings released immediately after planting and those left unreleased, but released seedlings made nearly double the height growth. All species except Longleaf Pine and Red Cedar were attacked by *Rhyacionia frustrana* and *Tetralopha robustella*. Underplanting of valuable hardwoods has also given good results. [Cf. *For. Abstr.* 12 (No. 1111).]

298. DREES, E. M. Het opzetten van tussen plantingsproeven en verwante experimenten. **[Bordered trial plots for testing the influence of interplanted rows of green-manuring crops in Teak forests (and allied experiments).]** *Tectona* 39 (4), 1949 (302–12 + 2 tbls.). [Du.e.]

The disadvantage of two adjacent sample plots in forest experiments, owing to variations in soil, and the impracticability of adequate replication because of the large area involved, are pointed out. A solution of this difficulty by the use of 'bordered plots' is explained. These consist of a 'central plot' framed by a 'border plot' of as nearly as possible the same area, the two being separated by an 'insulation' or buffer strip, of which half the width is treated like the central plot. The central and border plots must have as nearly as possible the same area and the same number of trees; and since the design is expressly for regular plantations, the relative dimensions of central plot, insulation strip and border are necessarily determined by (i.e. are multiples of) the spacing. The author gives tables for two typical planting spacings of Teak showing for each spacing and its multiples a working set of possible dimensions, along with the maximum period for which such plots can be used for each of 5 site classes, and indicates whether the long axis of the plots is to run with or at right angles to the rows.

299. GONČAR, A. I. Primenenie ljupinov dlja lesokuljturnyh celeĭ. **[Use of lupins in afforestation.]** *Lesn. Hoz.* 3 (4), 1950 (84–5). [Russ.]

Stresses the utility of lupins as ground cover for tree plantations, e.g. in shelterbelts and ravine plantations. *L. polyphyllus* var. *caesius* is particularly useful: once established (weeding and soil loosening are necessary only in the first year) it will go 20 years without attention, is shadebearing, withstands cattle trampling, and bears autumn frosts to – 8° C. and winter frosts to – 25° C. Annual species (*L. angustifolius* and *L. luteus*) are also useful and can be mixed with *L. polyphyllus* to suppress weed growth during the first year. All have a favourable effect on soil properties and on the growth and survival of tree plantations. White-grub populations are stated to be very low where lupins are used as cover, possibly because the dense growth may discourage ovipositing beetles or because the larvae may be repelled by the high alkaloid content of the plants.

300. MONFERRATO, R. Il bastardume. **[Forest weeds.]** *Schweiz. Z. Forstw.* 102 (4), 1951 (221–7). [It.g.]

Illustrates from Italian examples, the value of herbaceous and shrub growth in protecting the soil and forest regeneration, and the dangers attendant upon its removal.

236. *Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)*

See also Nos. 229, 287.

301. ALLEN, G. S., GRIFFITH, B. G., and KER, J. W. **A comparison of several regeneration survey methods in terms of cost and usefulness.** *B.C. Lumberm.* 35 (3), 1951 (66, 68, 89–90, 92, 94, 96). 7 refs.

Comparisons were made at the research forest of the University of British Columbia between the list-quadrat method, the 1- and 4-milliacre stocked-quadrat methods and a modified 4-milliacre stocked-quadrat method in which a single quadrat instead of the usual 4 is established at every sampling point. Results, given in graphs, show the relations between number of trees per acre and % stocking by 1- and 4-milliacre methods; between 1- and 4-milliacre stocking on the same 4-milliacre plots; between tally time, survey method and 1-milliacre stocking % for two 2-man crews; and between acreage surveyed per 8-hr. day and 1-milliacre stocking % for different methods of survey and for 2 different crews. The following conclusions were drawn: (1) the extra cost of the list method is not justified for ordinary regeneration studies: it should be reserved for special studies in which complete data are needed. (2) The stocked-quadrat methods suffice for estimating the degree of re-stocking reached. (3) Either the 1- or the 4-milliacre quadrat can be used satisfactorily if the standard for 'adequate' stocking is chosen to meet the needs of the area in question. A standard of 70% by 4-milliacres (as against 40% used by the northwestern United States) is suggested for the coastal forest of British Columbia. (4) A cheap reconnaissance survey can be based on the use of 4-milliacre quadrats spaced singly at regular intervals along compass lines.

237. *Amelioration of Forest Sites*

See also Nos. 19–20, 37, 198, 292–3.

302. HOENE, J. V. **Wringing out a Spruce bog.** *Amer. Forests* 57 (3), 1951 (20–1).

Preliminary account of an attempt to accelerate the growth of *Picea mariana* in a Minnesota bog by manipulating the water level. Natural drainage outlets are dynamited where necessary.

238. *Timber Plantation Crops requiring Special Treatment*

See Nos. 118–9, 287, 324.

24. TENDING OF STANDS AND TREES

See also Nos. 198, 340, 378, 537.

242. *Thinnings*

See also Nos. 118, 161, 193, 550, 569.

303. COSTANTINO, I. N. Parcelas experimentales permanentes—*Libocedrus chilensis* (Don) Endl. Estudios de crecimientos y regeneración natural. [**Permanent sample plots—*L. chilensis*. Studies of increment and natural regeneration.**] *Publ. téc. Minist. Agric. Argent.* No. 13, 1949. pp. 113 + 1 plate. 16 refs. [Span.]

Presents initial data from permanent sample plots established in 1945 in a naturally regenerated forest of *Libocedrus chilensis* in the Territory of the Chubut. The object of the experiment is to study the influence of different grades of thinnings on height and diameter increment and natural regeneration. Four 0·25 ha. plots were established and all dead material removed. Plot A was cleared of all trees except dominants, co-dominants and intermediate trees, evenly spaced. In Plot B only dominants and co-dominants were left, and in Plot C dominants only. Plot A was also pruned. The 4th plot was a control. The results of stem analysis of representative trees of each 5-cm. diam. class are presented in graphs and tables. Maximum height and diameter increment are reached in natural forest between the ages of 30 and 40.

304. BUNDY, O. Reflexioner över beståndsbehandling med ledning av provyteförsök i Sörmland. [**Reflections on treatment of stands, based on sample-plot research in Sörmland.**] *Svenska Skogsv-Fören. Tidskr.* 47 (2), 1949 (134–46). [Sw.]

Results of measurements made between 1926 and 1948 on even-aged Pine stands in Central Sweden, sown in 1901 and thinned for the first time in 1926, are given in graphs and tables. The following conclusions are drawn: (1) There is considerable variation between individual trees in a stand; with a very few exceptions, very vigorous trees have already taken the lead at 25–30 years. (2) Among the strongest trees about 100/ha. are so exceptionally vigorous that they are very little affected by their environment. (3) Individual trees, small and thin because of early overcrowding, may show diameter increment equal to that of less crowded trees, but cannot make up the early loss in increment. (4) Apart from some of the strongest trees, diameter growth is closely related to spacing. (5) Volume increment per unit of area is not affected by the number of trees if only those trees which at 30 years are dominant and vigorous are considered. Recommendations are made for thinning: small, weak trees should be removed when the young trees are about man's height; when the dominant trees are about 10 m. high, the best trees, *ca.* 400 per ha., should be selected and released; once the best trees show themselves, thinning can be carried out freely as convenient among the remainder of the trees.

305. BROOKS, R. O. **Thinning Red Pine.** *Pa. For. Wat.* 3 (1), 1951 (10–1, 22–3).

[Cf. *For. Abstr.* 10 (No. 1053).] Reports on the effect of crop-tree thinning in *Pinus resinosa* plantations.

306. ENGLE, L. G., and SMITH, N. F. **Height growth of thinned Red Pine.** *Tech. Note Lake St. For. Exp. Sta.* No. 351, 1951. p. 1.

Figures are given showing that height growth over a 10-year period was greater in the thinned than in the unthinned portions of a 43-year-old natural stand and a 27-year-old plantation.

243. *Opening of the Canopy (Increment, Overhead Release and Improvement Fellings)*

307. EYRE, F. H., and LONGWOOD, F. R. **Reducing mortality in old-growth northern hardwoods through partial cutting.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 24, 1951. pp. 13.

The study was based on data from 24 acres in permanent sample plots dating back to 1926, 12-year records of cutting units covering 175 acres, and a 6-year record of growth and mortality on 472 inventory plots, some of which were uncut. Net mortality in uncut stands was about 100 bd. ft. per acre per year, almost as much as growth. In partial cuttings mortality was only $\frac{1}{2}$ to $\frac{1}{3}$ that of the uncut stands and was far exceeded by growth. The very light cuttings were less successful in reducing mortality than heavier ones which allowed more scope for removing defective trees. Stands cut to an intermediate degree had especially low mortality, an average of less than 10 bd. ft./acre. Most of the data were for pure hardwoods, but some information was obtained for Hemlock, which had a mortality much higher than that of the hardwoods. Ash/Elm types showed higher mortality than well drained upland hardwoods. Sugar Maple, the most important component, suffered relatively little loss, while Yellow Birch lost more in proportion. Breakage was the most common cause of mortality, followed by trees that died standing, and those that were uprooted. Losses appeared to be proportional to the amount of defect left in the stand, and care should be taken to eliminate defective trees in partial cutting.

308. LANGE, K. D. **Effects of clear cutting understory hardwoods on the growth of a Shortleaf-Virginia Pine stand [in Tennessee].** *J. For.* 49 (3), 1951 (176–8).

The stand in which this experiment was carried out was a 26-year-old, even-aged mixture of *Pinus echinata* and *P. virginiana* (72% of basal area) with mixed hardwood understorey (28% of b.a.). All hardwoods and a few defective Pines were removed on experimental plots, reducing total b.a. by 36%.

During the following 11 years, hardwoods averaged 2% of b.a. on treated plots and increased 1–29% on the control. In the same period, the b.a. of residual Pine increased 35% for treated plots and 32% for the control. It is concluded that the hardwood understorey did not increase or diminish the growth of the overstorey Pine, and the costly removal of non-merchantable hardwoods is not recommended for such stands in the Tennessee Valley region.

309. Mann, W. F. Jr. **Profits from release of Loblolly and Shortleaf Pine seedlings [from inferior hardwoods in Arkansas].** *J. For.* 49 (4), 1951 (250–3).

Cutting all hardwoods of 2 in. d.b.h. and over gave net returns of $1.18/acre from first thinnings at 1949 prices and costs.

310. Roe, E. I. **Early release from Aspen improves yield of Pine plantations.** *Tech. Note Lake St. For. Exp. Sta.* No. 353, 1951. p. 1.

Figures are given showing that even delayed release increased the volume of Red Pine [*P. resinosa*]. A plot needing no release (comparable to a plantation released promptly) would yield, if felled now, 25–40% more cash return than plots where release was long postponed.

311. Engle, L. G. **Releasing White Pine from Oak and Aspen.** *Tech. Note Lake St. For. Exp. Sta.* No. 346, 1951. pp. 2.

Success in releasing White Pine [*P. strobus*] from Oak and Aspen overstoreys depends primarily on the height of the Pine when released; small suppressed trees often become overtopped by sprouts, and need release again. Observations suggest that Pine must be at least 4–5 ft. and preferably 6–8 ft. before it can compete successfully with hardwood sprouts. It usually takes 2–3 years after release to respond with increased height growth. Some figures showing height growth of the released Pine and of sprouts are shown in graphs.

312. Derjabin, D. I. Vlijanie osvetlenii i pročistok na razvitie duba. **[The influence of release cuttings on the development of Oak.]** *Lesn. Hoz.* 3 (4), 1950 (54–7). [Russ.]

Gives the results, which are tabulated, of experiments in two areas of a forest in the Tartar A.S.S.R. on the treatment of young Oak held in suppression by other faster-growing hardwoods. Drill sowings of Oak had been made in rows 1·5 m. apart in 1932 and 1933 respectively, and both areas had been invaded in the first few years after sowing, by dense natural regeneration of Birch. In the winter 1947–8 the Birch was clear-cut on ⅔ of the area sown in 1932. It formed a dense canopy some 8 m. high over the Oak, which survived in sufficient numbers as crooked, spindly trees about 1·5 m. high, the majority having multiple stems. After the cutting of the Birch, these received only side shade from raspberry bushes and other sparse underwood. In 1948 the leaves of the taller Oaks were cut by late frosts, and owing to the sudden release no increase of height growth occurred. By mid-August 1949 dense coppice of Birch (2 m.) and also Sallow (3–4 m.) had sprung up, but the height growth of the Oak was 178% that of the control plot, the number and dry weight of leaves per shoot had increased markedly, and 75% of the trees now had a central leader, as compared with 27% on the control. Lateral shade from the coppice was presumably favourable, but in 1950 partial cutting of coppice must be undertaken to free any Oaks in danger of suppression. On the area sown in 1933 overhead release was effected in Sept. 1948 by cuttings removing respectively 19% and 50% (by volume; or 21 and 48% by number) of the Birch, so far as possible from the Oak rows, leaving the remainder for temporary protection. On inspection in Aug. 1949, both plots showed 50% of the trees still lacking central leaders, but most of these may be expected to develop leaders in 1950, and significant improvements had occurred in height growth (152 and 140% of that of the control) and dry weight of leaves (150 and 164%). Coppice of the Birch had reached a height of 80 cm.

As early suppression is the chief cause of crookedness in Oak butt logs—the most valuable part of the tree—the importance of early tending is evident. Results are considered to support the desirability of gradual removal of competing growth to avoid sudden exposure of suppressed Oak.

313. **Chemical control of woody plants.** *Rep. Lake St. For. Exp. Sta. 1950* [1951] (8–9).

Results of a study in which Ammate crystals were applied in notches or cuts and different concentrations of Esteron were sprayed on the lower 4 ft. of stem, show that the chemicals give first-season kills ranging from 83% for White Oak to 100% for Aspen when applied in winter, spring or summer. Figures showing quantities used and time taken are tabulated. In two different plantations, 12–40 Red Pines per acre, growing near clumps of Aspen treated with ammonium sulphamate crystals during the spring, died. Studies to determine the minimum effective rate per acre showed that kills of Hazel brush were as good with 40–60 gal./acre of 2,4-D, 2,4,5-T, and combinations of the two, in concentrations of 2,500 to 5,000 p.p.m., as with 80–150 gal.

314. Peevy, F. A. **New poisons for undesirable hardwoods.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 72, 1951 (3–4).

Results are given showing the effectiveness after 4 months of 8 formulations of 2,4-D and 2,4,5-T, compared with Ammate, in killing Blackjack Oaks 2–10 in. in d.b.h. In general, isopropyl ester of 2,4-D gave the most consistent and effective results. No recommendations will be made until pilot tests are conducted and more reliable cost data are available.

315. **Chemical control of undesirable hardwoods.** *Rep. Sth. For. Exp. Sta. 1950* [1951] (11–3).

Results of various experiments show that the application of Ammate crystals in cups, although very successful, is rarely justified economically except where small seedlings, less than 3 ft. high, are to be released from numerous small hardwoods, as in scrub Oak conversion by underplanting. Two-hack or notch girdling appears to be economically best for killing most species of upland hardwood trees above 9·5 in. d.b.h., while frilling followed by treatment with a 19·3% Ammate solution appears to be best against trees below 9·5 in. d.b.h. Simple

frilling would probably be satisfactory on all sizes of trees if the cambium were ringed completely. [Cf. *For. Abstr.* 12 (No. 2945).]

245. *Tending of Trees, Pruning etc.*

See also Nos. 118, 155–6, 236.

316. HEGEL, D. VON. Neue Untersuchungsergebnisse zur Planung und Technik der Fichtenästung. [**Results of recent studies in the planning and technique of pruning Spruce.**] *Forst u. Holz* 6 (10), 1951 (142–5). 10 refs. [G.]

317. [**Pruning *Pinus radiata*.**] *Rep. For. Timb. Bur. Aust. 1949* [? 1950] (17).

The results of a pruning experiment in a medium-quality stand of *P. radiata* spaced 9 × 9 ft., during its passage from 6 to 14 years of age, were analysed. Pruning to 20 ft., carried out in 4 stages, resulted in no serious reductions in growth when applied as follows: pruned to 4 ft. at average height of 19 ft., to 8 ft. at 25 ft., to 12 ft. at 31 ft., and to 20 ft. at 47 ft. [Cf. *For. Abstr.* 11 (No. 2705).]

318. STAPLETON, C. C. **Correct pruning raises value of trees for timber.** *Farmer's Weekly, Bloemfontein* 14 March, 1951 (10, 11, 13).

Describes the methods generally employed in S. African state plantations for pruning *Pinus radiata* and *Eucalyptus diversicolor*.

319. HEYDEN, D. Geräte fur die Aufästung. [**Pruning tools.**] *Forst u. Holz* 6 (10), 1951 (140–2). [G.]

26. FORESTRY IN AGRICULTURAL AND PASTORAL AREAS (INCLUDING SHELTERBELTS AND THEIR TREATMENT)

261. *Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land*

320. ROSAYRO, R. A. DE. **Some aspects of shifting cultivation in Ceylon.** *Trop. Agriculturist, Ceylon* 105 (2), 1949 (51–8 + 1 map + 6 plates). 13 refs. O.R.E.

Discusses forms and practice of '*chena*' cultivation in Ceylon, its effects on soil fertility and the ecological changes which it brings about. Considers problems of restoring abandoned '*chenas*', particularly in dry mixed evergreen forest, where natural regeneration is not successful, and reviews achievements and possibilities of co-operative ('taungya') reforestation.

321. JACKSON, J. K., and SHAWKI, M. K. [Compilers]. **Shifting cultivation in the Sudan with particular reference to forestry.** *Sudan Notes and Records, Khartoum* 31 (2), 1950 (210–22). 9 refs. L.S.

264. *Farm Forests*

322. MILOŠEVIĆ-BREVINAC, M. Bagrem i pajasen u seljačkom pošumljavanju. [***Robinia pseudoacacia* and *Ailanthus altissima* in farm afforestation.**] *Šum. List* 74 (9/10), 1950 (401–9). [Serb.russ.]

The spread of both species in the countryside (particularly in the vicinity of Belgrade) has passed through 3 stages: (1) chance natural regeneration, (2) planting of roadsides and banks, (3) planting of small forests. This development is explained by the disappearance of forests in the countryside and by the need for fuel and constructional timber. *Ailanthus* in Serbia has only recently become an important species. The extent of *Robinia* and *Ailanthus* stands is relatively large and continues to increase. *From author's summary.*

323. GÖHRE, K. Die Robinie (Akazie), ein wichtiges Holz des Bauernwaldes. [***Robinia pseudoacacia*, an important timber for farm woodlands.**] *Dtsch. Landwirtsch.* 2 (4), 1951 (213–6). 10 refs. [G.]

Notes on yield, silvicultural requirements, physical and mechanical properties, and uses. [Cf. *For. Abstr.* 13 (No. 199).]

324. PEACE, T. R. **Poplar as a farm crop.** *Agriculture (J. Minist. Agric., Lond.)* 57 (10), 1951 (473–7 + 2 photos). 1 ref. O.R.E.

Suitable soils, methods of raising plants, pruning, recommended varieties, costs and returns. Assuming a rotation of 25 years, profit per tree is estimated at £4. 0*s*. 3*d*.

325. BROCKWAY, G. E. **Trees for the wheat belt [in W. Australia].** *Leafl. Dep. Agric. W. Aust.* No. 977, 1949. pp. 14. (*Repr.* from *Journal of the Department of Agriculture of Western Australia, Perth (Ser. 2)* 26 (3), 1949 (178–89).)

Choice of species and methods of planting shade and shelter trees. Characteristics of some 30 species, mainly Eucalypts, are tabulated.

266. *Shelterbelts, Windbreaks*

See also Nos. 279, 293, 881.

326. JOVKOVIĆ, B. Prvi rezultati radova na poljozaštitnim šumskim pojasima u Makedoniji. [**First results of work on forest shelterbelts in Macedonia.**] *Šum. List* 74 (6), 1950 (221–34). [Serb.]

Work began in autumn 1937. In 1941, there were, near Rzanicany village (near Skoplje), 8 km. of experimental shelterbelts, distributed in 155 plots. Test trees (1–7 in each plot) were measured 3 times p.a. The place lies on a climatic divide; winds from many points of the compass desiccate the soil; the average precipitation is 478 mm. p.a., but from 1924–39 it was only *ca.* 340 mm. Maximum monthly rainfall (May) is 53·4 mm., minimum (February) 21 mm. Relative humidity averages *ca.* 70%, temperature *ca.* 13° C., annually. Shelterbelt design presented great difficulties because of variable winds, and the Soviet pattern (for steppes with one predominant wind direction) could not be copied. Shelterbelts were laid out 100–500 m. apart. Transverse belts were seldom used, the main shelterbelts being instead laid out in irregular lines. Their width was 10–30 m. The soil was ploughed, then 46 species (listed; mostly hardwoods) were sown or planted at 1–1½ m. spacing, followed by tending. Surface cultivation to preserve moisture was done 3–4 times in the first year, twice during the 2nd year, and once in the 3rd year (plus beating up). The shelterbelts are in 1 to 5 height stages or steps. In single-step belts the best results were obtained with *Juglans regia, J. nigra, Ailanthus altissima, Robinia*

pseudoacacia, *Gleditschia triacanthos*, and *Quercus* sp., in that order. Thus the figures for *J. regia* for 1938 (time of planting), 1939, 1940, and 1950, were: (1) height 15, 140, 250, and 850 cm., respectively and (2) diameter (not measured in 1938), 24, 32, and 100 mm. Of 24 two-step combinations tested, the best were: *R. pseudoacacia*/*Koelreuteria paniculata*, *R. pseudoacacia*/*Amorpha fruticosa*, *Acer* (*pseudoplatanus*?)/*Catalpa bignonioides*, *Morus alba*/*C. bignonioides*, *Populus* '*canadensis*'/*Amorpha fruticosa*, and *R. pseudoacacia*/*A. altissima*. For the combination *R. pseudoacacia*/*K. paniculata*, the following figures are quoted for their respective heights (*Koelreuteria* height in brackets)—in 1938, 130 (95) cm.; in 1939, 220 (180) cm.; in 1940, 365 (220) cm.; and in 1950, 780 (520) cm.; and for diameters—in 1939, 23 (20) mm.; in 1940, 37 (33) mm.; and in 1950, 72 (53) mm. Of 23 three-step combinations tested, the best were: *R. pseudoacacia*/*G. triacanthos*/*A. fruticosa*, and *R. pseudoacacia*/*A. pseudoplatanus*?)/*A. fruticosa*; for the former combinations, heights, in the order of species given were—in 1938, 200, 70, 65 cm.; in 1939, 365, 141, 142 cm.; in 1940, 510, 180, 200 cm.; and in 1950, 800, 400, 310 cm.; and corresponding diameters—in 1939, 37, 15, 15 mm.; in 1940, 50, 15, 17 mm.; and in 1950, 85, 28, 22 mm. Of 25 four-step combinations tested the best was *Acer negundo*/*M. alba*/*A.* (*pseudoplatanus*?)/*A. fruticosa*. One of the best 5-step combinations was *R. pseudoacacia*/*A. negundo*/*M. alba*/*Carpinus betulus*/*A. fruticosa*. Instructions require the following species to be cut back to ground level immediately after planting: *A. fruticosa*, *K. paniculata*, *Maclura pomifera*, *G. triacanthos*, *R. pseudoacacia*, and *Populus simonii*, whereas cutting back is not obligatory for: *Fraxinus* sp., *Carpinus betulus*, and *Ulmus* sp.

327. Ivanov, V. V. Ob ispoljzovanii stepnyh poniženii v polezaščitnom lesorazvedenii. [Use of depressions in the steppe in shelterbelt forestry.] *Priroda, Moskva* 39 (11), 1950 (54–5). A.P.B.

Stresses the relatively favourable soil and microclimatic conditions for tree growth to be found in the numerous natural depressions in the steppes round the northern end of the Caspian Sea, and urges that the lines of shelterbelts should be planned so as to pass through as many of these depressions as possible. The largest depressions should be surrounded by shelterbelts. Species of shrubs that grow wild in the depressions should be used as nurses to the trees forming the plantations.

328. Nikoliskiĭ, V. L. Posevy duba gnezdovym sposobom v stepnoĭ i lesostepnoĭ zonah. [Direct sowings of Oak by the 'nest' method in the steppe and forest-steppe zones.] *Lesn. Hoz.* 3 (3), 1950 (73–5). [Russ.]

Briefly reviews first-year results of shelterbelt sowings by this method at 11 places, with areas totalling 60 ha., in Penza, Stalingrad and Saratov, in 1949. Concludes—in agreement with experience elsewhere—that this method improves the growth, drought resistance and survival of Oak in the steppe and forest-steppe, and that the presence of agricultural crops between the rows of Oak is beneficial as regards both growth of the tree seedlings and the saving of the labour of tending which would otherwise be necessary.

329. Rusanov, F. N. Tamariksy v polezaščitnyh polosah. [Tamarisks in field shelterbelts.] *Lesn. Hoz.* 3 (3), 1950 (40–2). [Russ.]

Gives brief notes on some of the 16 species of *Tamarix* found in the U.S.S.R. and their probable value for shelterbelt plantations. A feature of special value is the ease with which they can be propagated by cuttings, either nursery-grown or planted out unrooted on suitable sites. For the former the usual size of cutting is 20–25 cm. long × 1–1·5 cm. thick, and for the latter, 30–40 × 1–2 cm. Nursery-grown rooted cuttings reach *ca.* 1 m. during their first year and may be planted out either in autumn or the following spring; in either case they should be cut back almost to ground level and the cut stems used to make further cuttings. Stool beds, where necessary for producing cuttings in the nursery, should have stools spaced 1·5 m. in and 2·5 m. between the rows. Cuttings are ordinarily made in autumn or winter and stored in moist sand until spring, when they can be planted out directly in the shelterbelts if the site is suitable. Hybrid material [of unspecified parentage] is said to root especially well, even in the hot summer months. Hybrids were raised by the author in Tashkent from seed sown uncovered on sand in pots continuously watered by infiltration from below. In warm sunny weather germination took only one day. Seedlings were pricked out into pots, and when 5–7 cm. tall, to nursery beds. At 2 years old, when ready for planting out, they were cut back as usual and further propagated from the cuttings so obtained. All the species demand light and warmth and should be planted on the sunny sides of shelterbelts. Extensive use of Tamarisk is envisaged for the shelterbelts that will run from Gur'ev to Uralsk and Čkalov and from Astrakhan to Kuibyshev. For the northern parts of these belts only *T. ramosissima* and *T. gracilis* are suitable, but in the south *T. hohenackeri*, and on saline soils *T. pubescens* (which will not grow on non-saline soils), are also recommended, and trials may be made of other species and hybrids. *T. ramosissima* and some other species will eventually become small trees up to 6 m. tall under favourable conditions, will yield firewood, and will coppice well after cutting.

330. Burvill, G. H. **Windbreaks and shelterbelts in relation to soil erosion.** *Leafl. Dep. Agric. W. Aust.* No. 1004, 1950. pp. 5. (*Repr.* from *Journal of the Department of Agriculture of Western Australia, Perth* (*Ser. 2*) 27 (2), 1950 (180–4).)

Reprint of a broadcast talk on the use of windbreaks to check sand drift and fix sandy soils.

268. *Pastured Forests. Grazing on Forest and Open Ranges*

See also Nos. 394, 399 *et seq.*, 446–7, 881.

331. Corns, W. G., *et al.* **Experiments on chemical control of woody growth—report for Alberta and Saskatchewan.** *Proc. 3rd West. Canad. Weed Control Conf.* 1949 (93–8). O.R.E.

[Cf. *For. Abstr.* 13 (No. 399), where part of the work summarized here also appears.] The experiments indicate that where Wild Rose is the only problem, 2,4,5-T can be recommended. Where Willows and other plants susceptible to 2,4-D are being treated, 2,4-D is cheaper. In an association where there are species resistant to 2,4-D, a mixture of selective herbicides will give satisfactory results. Greatest success follows early summer applications to vegetation in full leaf. Rates of 1½–2 lb. acid equivalent per acre give best results when large volumes of water are used, to ensure good coverage of dense growth. Among the papers abstracted are the following: Effects of 2,4-D, 2,4,5-T and their mixture on woody growth (*W. G. Corns*); Response of woody species to herbicides (*R. T. Couplant*); Effect of 2,4-D and 2,4,5-T on *Symphoricarpus occidentalis* (*W. J. Breakey*); and Effect of 2,4-dichlorophenoxyacetic acid formulations sprayed on *Symphoricarpus occidentalis* in pasture using 3 different rates (*H. W. Leggett*).

332. Craig, H. A. **Eradicating woody growth with chemicals in Manitoba.** *Proc. 3rd West. Canad. Weed Control Conf.* 1949 (89–93). O.R.E.

A report on work done in 1948 and 1949.

333. Hansen, H. L. **A twelve month spray schedule for killing woody plants in northern pastures and woodlots.** *Proc. 6th ann. Nth. Cent. Weed Control Conf.* 1949 (56–8). O.R.E.

334. Coulter, L. L. **Brush control in Southern pasture and range land.** *Proc. 6th ann. Nth. Cent. Weed Control Conf.* 1949 (55–6). O.R.E.

A summary of recent research.

335. Young, D. W., and Fisher, C. E. **Factors affecting the absorption and translocation of herbicides in Mesquite (*Prosopis juliflora*).** *Proc. 12th ann. West. Weed Control Conf.* 1950 (41–8).

Summarizes experiments in the control of this species, and describes tip immersion and shield tests for estimating the translocation of herbicides within the plant. Absorption and translocation are affected mainly by the stage of growth of the plant, the chemical used, the duration of temperature above 80° F. immediately after treatment, and the period of humidity above 80% when the temperature is moderate. The 2,4,5-T ester in water is absorbed and translocated more consistently than any herbicide tested, and the amines of 2,4-D and 2,4,5-T are translocated over a longer period of time than are the esters. [Cf. *For. Abstr.* 12 (No. 1559).]

336. Blair, B. O. **Recent results of basic physiological studies of Mesquite in the Southwest.** *Abstr.* in *Proc. 12th ann. West. Weed Control Conf.* 1950 (104). [Southwestern Forest and Range Experiment Station, Tucson, Ariz.] O.R.E.

When aqueous solutions of the Na salt of 2,4-D and the free acid of 2, 4, 5-T were injected into *Prosopis juliflora*, movement of the solutions was confined to the xylem tissue, and was much greater upward than downward; lateral movement was restricted to the tissue immediately adjacent to the injected part. The free acid of 2,4-D and 2,4,5-T completely suppressed growth of seeds at a concentration of 10 p.p.m. On 24-hour-old seedlings suppression ranged from 61% at 1 p.p.m. to 99% at 10 p.p.m., the 2,4,5-T being more effective than 2,4-D at all concentrations above 1 p.p.m. Aqueous solutions of the amine salt of 2,4,5-T injected into the cambium of freshly cut stumps at the bud zone produced 32, 90 and 96% suppression respectively at 1,000, 10,000 and 20,000 p.p.m. Paint-brush applications of 2,4,5-T to the bark in the form of a slurry produced 59, 93 and 100% suppression of coppicing at these same concentrations.

337. Flory, E. L., *et al.* **Weed problems and control in eleven Western States.** *Proc. 12th ann. West. Weed Control Conf.* 1950 (12–36). O.R.E.

The following points of interest concerning woody species were reported: (1) The Bureau of Reclamation (Region 7) have been testing out herbicides on Salt Cedar [*Tamarix* sp.?]. Good results were obtained with 2,4-D on young plants, and both foliage and dormant sprays gave fair control of older trees. Most successful were large-volume applications from ground equipment. (2) Research by the U.S. Forest Service has shown that Big Sage Brush [*Artemisia tridentata*] ranges can be improved by planned burning and regulated grazing. Tests with 2,4-D have given erratic results [cf. *For. Abstr.* 11 (No. 3275)]. (3) Studies on Mesquite [*Prosopis uliflora*] have shown that it is susceptible to 'hormone'-type weedkillers, but limited absorption and movement within the plant, when these substances are applied as foliage sprays, has prevented the development of large-scale control measures [cf. preceding abstracts]. (4) *Juniperus* spp., which have invaded some range lands of the West, are effectively removed by grubbing, or Na_2HAsO_3 applications. So far, cheap mechanical methods are the most effective means of control.

338. Hill, A. C. Jr., and Doran, C. W. **Preliminary guide to reseeding Pinyon-Juniper lands of Western Colorado.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 4, 1950. pp. 16.

Includes notes on the killing, by scorching, brushland ploughing, felling and girdling or poisoning with Na_2HAsO_3, of Pinyon (mostly *Pinus edulis*) and Juniper (mostly *Juniperus utahensis* with some *J. monosperma* and *J. scopulorum*) in order to increase pasture.

27. ARBORETA. ARBORICULTURE FOR ORNAMENTAL PURPOSES. HEDGES AND HEDGE PLANTS

See also No. 211.

339. Benson, J. L. **Hergest Croft—an arboricultural note.** *Quart. J. For.* 45 (2), 1951 (117–9).

Describes a private arboretum in Herefordshire, with dimensions and rate of growth of 15 conifers.

28. HUSBANDRY OF FOREST PRODUCTS OTHER THAN WOOD

See also Nos. 207, 235.

340. Ferrand, M., and Ollagnier, M. **Premiers résultats d'une expérience d'aménagement et d'éclaircie de la palmeraie naturelle. [Preliminary results of an experiment in managing and thinning a natural Palm stand.]** *Oléagineux, Paris* 5 (5), 1950 (296–300). [F.] O.R.E.

First results of an experiment begun in 1946 in a 50- to 70-year-old stand at Grand-Drewin (Ivory Coast). In unthinned but tended control plots, total oil production rose from 290 kg./ha. in 1947 to 830 kg./ha. in 1949. By 1949 a marked difference was evident between thinned and unthinned plots. Plots tended and thinned to 160 trees per ha. produced, in 1949, 1,125 kg. of oil/ha., an increase of 30% over the control (approximately 213 trees per ha.). Important features in the maintenance of the stand were scrub clearance, elimination of unserviceable trees, pruning of dry and dead leaves from the crowns, and elimination of epiphytes.

341. Corr, J. E. **Carob or St. John's Bread.** *Econ. Bot.* 5 (1), 1951 (82–96). 22 refs.

Comprehensive notes on *Ceratonia siliqua*, including soil and climatic requirements, cultivation, propagation, harvesting and commercial uses of the pods. [Cf. *For. Abstr.* 13 (No. 823).]

342. Islip, H. T., and Matthews, W. S. A. **Slash Pine oleo-resin from British Honduras.** *Colon. Plant Anim. Prod.* 1 (3), 1950 (217–22).

About 145 sq. miles of Pine forest in British Honduras are considered suitable for tapping. In 1949, tapping tests were carried out on Slash Pine growing in the south of the colony. Both French and American hacks were tried, but the latter were preferred as giving a neater, cleaner cut. Trees of 12 to 14 in. diameter gave better yields than larger trees. Some trees suffering from termite damage within the trunk gave as good a yield as sound trees. Results are given of tests by the Colonial Products Advisory Bureau of the oleo-resin, and by the Bureau and two commercial firms of the purified resin and oil of turpentine. These showed that the oleo-resin is of normal character and that the resin and turpentine are of satisfactory quality.

343. Kantchaveli, G. J. La culture du bambou en Russie soviétique. **[The cultivation of Bamboo in Soviet Russia.]** Selhozgiz, Moscow. 1950. pp. 40. [Russ.] *Abstr.* in *Agron. trop.* 6 (3/4), 1951 (198–9). [F.]

There are some 5,000 ha. of Bamboo plantation on the Black Sea Coast, in Transcaucasia and Southern Crimea. Seven species of *Phyllostachys* and 2 of *Arundinaria* are commonly used, the former enduring temperatures as low as – 15° C. and the latter as low as – 24° C. Planting stock is usually derived from root cuttings grown for 3 years in the nursery and stumped before transplanting, 2–3 branches with leaves being left on the stumped plants. During the 2nd and 3rd years in the nursery, fertilizer is applied at 100 kg. N, 100 kg. P, and 100 kg. K per ha.

The larger species are planted out in the field at 625/ha. or a spacing of 4 × 4 m., and the smaller at 1,111/ha. or 3 × 3 m. The planting holes receive 4–7 kg. of well rotted manure before planting, and inorganic fertilizers (N, K, and P) are applied to the plantations in each of the first 5 years (table of quantities given). Harvesting begins in the 3rd year at a rate of 3,000–3,500 culms/ha./year. [Cf. *For. Abstr.* 13 (No. 267).]

344. Kadambi, K., and Rawat, A. S. **On the causes of congestion in *Dendrocalamus strictus* (Nees).** *Indian For.* 75 (6), 1949 (1951), (198–213 + 3 photos). 6 refs.

A congested Bamboo clump is one in which the culms not only grow too densely but are also more or less deformed. An experiment was started in 1934 at Dehra Dun to determine the causes of congestion. Comparable sets of clumps were subjected to 6 kinds of felling treatment resembling that normally used in natural forest. These treatments were: (*A*) cutting from the periphery one-half the total number of mature culms in the clump; (*B*) cutting from the periphery one-half the total number of new and mature culms in the clump; (*C*) as (*A*) but cutting high, i.e. at 4½–5½ ft.; (*D*) cutting one-half the total number of mature culms on a thinning principle, i.e. leaving the remaining culms uniformly distributed over the clump; (*E*) topping, i.e. breaking or splitting the tops of the new culms; and (*F*) untreated controls. Treatments were continued for 12 years, except (*E*) which after 6 years was clearly having uniformly deleterious effects. Of the others, treatments (*A*) and (*B*) were significantly inferior in respect of number and diameter of new culms produced, and (*C*) was even less satisfactory. Treatment (*D*) gave the best results, the resulting clumps being equal to controls in number and diameter of new culms and superior to them in the matter of congestion. Provenance tests carried out at the same time seem to indicate that heredity may have some bearing on the amount of congestion occurring.

345. Quate, G. S. **Thailand's lac industry.** *Foreign Agric.* 15 (3), 1951 (60–3). E.M.B.

3. HARVESTING OF WOOD, LOGGING AND TRANSPORT. RATIONALIZATION OF WORK; WORK STUDIES. FOREST ENGINEERING

See also Nos. 564–9.

32. FELLING AND RELATED OPERATIONS

See also Nos. 8, 118, 354–7, 360, 755, 760–1.

346. HEBBLETHWAITE, C. H. C. **Sharpening sawing chains with a saw gulleting machine.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 184, 1951 (6–7).

Describes a method developed by the Utilization Section of the Division of Forest Products for sharpening accurately the sawing chains used on power chain-saws by grinding on stock-pattern gulleting machines in which a special filing vice is incorporated.

347. **New portable log debarker can be moved into woods.** *Sth. Lumberm.* 182 (2283), 1951 (91–2).

Describes the Pearce log barker, mounted on skids for easy transport, which takes logs from 8 in. to 5 ft. in diameter. Logs are rolled into it and are cradled by a series of chains. The log revolves on its axis, while the chain cutter bars work across the top and remove the bark.

348. VENET, J. Découpes et classement. [**Assortments and grading.**] *Rev. for. franç.* 1951 (4), (241–67). [F.]

Shows graphically, by a combination of diagrams and plotted curves, the principal assortments and log grades for Oak (Pedunculate and Sessile), Beech, Scots Pine, Silver Fir, and Norway Spruce, grown in France.

33. DEGREE OF UTILIZATION AND WASTE. CLEARING THE FELLING SITE

See also Nos. 715–6.

349. SAKS, E. V. **Peeler bolt waste can be reduced.** *Veneers & Plyw.* 45 (4), 1951 (30, 32). P.R.

Emphasizes the need for proper logging technique to avoid unnecessary waste, especially in the case of Yellow Birch peeler logs. When felling, the Humbolt notch should be used because it leaves a flat end on the butt log. The cross-cutting should be intelligently supervised.

350. [WALTER, R.] **Stumps no longer stump Maplewood Park Director.** *Trees, Cleveland, Ohio* 11 (3), 1951 (21).

Trees are felled as close to the ground as possible, and holes are then bored, 2–3 in. apart and 6–8 in. deep, all over the top surface of the stump, using a specially fitted 2-in. drill powered by a Stanley heavy-duty electric motor with reversible switch. Holes can be drilled at the rate of 3/min. The stump is then easily chopped out to a depth of 10 in. with an axe and can be sodded over.

34. STORAGE IN THE FOREST AND AT LOG DUMPS

See also Nos. 361, 755.

351. TUOVINEN, A. Paperipuiden kuivumisesta keväisin varastoalueilla. [**Spring drying of pulpwood in the storage area.**] *Metsät. Aikak.* 1950 (6), (213–8). [Fi.e.]

An account of comparative studies with Pine and Spruce pulpwood, stored beside rivers or lakes, by Metsäteho in April–May 1948. The importance of complete barking, of cross-stacking and of good siting was demonstrated. Logs felled and barked the previous autumn did not dry out so well as logs barked in the depot in April. The data are supplemented by numerous diagrams and graphs.

352. RONKANEN, A. J. Metsäkäsittelyn ja välivarastoinnin vaikutus kuitupuun laatuun. [**The influence of forest handling and transition storage on the quality of pulpwood.**] *Pap. ja Puu* 33*B* (4*a*), 1951 (140–8). [Fi.e.] P.R.

Recommendations are made for preventing fungus damage in pulpwood during the 1–4 years between felling and arrival at the mill. (1) Normal forest stacking should not continue at above + 8° C. nor crosswise stacking at above + 13° C. (2) Stacking the bolts crosswise immediately after barking, lengthens the felling season to the end of June and allows it to begin 2 weeks earlier in the autumn. (3) Bolts infected with decay will not be seriously damaged as long as they contain water to less than 28% of their dry weight; if they are floated and then left in poor drying conditions at the mill, the fungi will develop rapidly. Care should therefore be taken to prevent fungus attack both at the felling stage, and at shore and mill storage sites. (4) No felling should be done in July and August unless the wood is to be pulped the following winter and the colour of the pulp is unimportant (e.g. Pine sulphite, and fodder cellulose). (5) Pulpwood should be stored at large transition sites on open ground rather than in small forest sites if it is to be left for longer than one summer. (6) Firm foundation timber and crosswise stacking are essential for storing pulpwood 1·5 m. and over at transition storage sites.

35. RATIONALIZATION OF WORK. WORK STUDIES

See also Nos. 8, 565.

353. BERGSTEN, G. Oversigt over arbejdslærens fysiologiske og bevægelsestekniske grundlag: et bidrag til skovbrugets arbejdslære. [**A review of the principles of physiology and motion technique as applied to work studies: a contribution to the study of work in forestry.**] *Dansk Skovforen. Tidsskr.* 35 (5), 1950 (217–65). 8 refs. [Dan.]

Divided into two major sections, of which the first deals with physiological aspects of forest work under the headings of fatigue, endurance, the heart, training, nutrition, and thermal economy and hygiene (including notes on 'warming up', effects of wet and cold, clothing and footwear, and dwelling conditions). The second section deals in detail with individual operations—felling with the axe, trimming, felling with the 2-man saw, cross-cutting, felling with axe and 1-man saw, lifting and carrying, digging, and shovelling—based on motion studies

made by the author and illustrated by diagrams of working positions and movements.

354. STAMM, E. P. **Power vs. hand felling and bucking in logging operations of the west.** *Pulp Paper Mag. Can.* 52 (4), 1951 (114, 117). 1 ref.

Discusses briefly the advantages of the power chain saw over hand saws in increasing output, reducing labour requirements and costs, and giving greater safety.

355. MAKKONEN, A. Kannattaako moottorisahoja käyttää vanerikoivujen rasiinkaatoon? **[Is it profitable to use motor-saws for summer felling veneer Birch?]** *Metsät. Aikak.* 1950 (6), (197–8, 201). 4 refs. [Fi.]

Preliminary time study, comparing axe (laying in), hand- and motor-saw performance for a range of stem diameters and of tree spacings. Results are graphed.

356. OSBORN, R. M. **Bow, chain or cross-cut saw for mine props.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 72, 1951 (2).

A 3-man crew with a 24-in. power chain-saw was faster and cheaper in producing 4- to 6-ft. props than 2-man crews using a Swedish bow or a conventional cross-cut saw. For 3- or 4-ft. props, from trees 5–6 in. d.b.h., a 2-man bow-saw crew is more economical. The power saw felled 9-in. trees in about half the time and at about $\frac{4}{5}$ the cost of either of the other saws; there was little difference between the cross-cut and the bow saw in felling 5- to 9-in. trees, but the cross-cut was 15% faster for 11-in. trees. For cross-cutting, the power saw with bow attachment was 30% faster and 10% cheaper than the bow saw for 9-in. trees, but for 5- and 6-in. trees the bow was slightly cheaper. For props with end diameters of 4–9·5 in. the bow required 10% less time than the cross-cut; for larger diameters the cross-cut was superior.

357. HOOKER, L. W. **The causes of wood accidents.** *Wood, Chicago* 6 (2), 1951 (27,39–41). P.R.

Discusses and analyses various types of injuries met with in the logging industry. Graphs show (1) the % distribution of wood accidents by primary cause, (2) type of injury %, (3) part of body injured in %, and (4) kind of work during which the injury occurred. It is claimed that 28% of the accidents reported in the survey could have been eliminated by proper training, education and supervision.

37. TRANSPORT

See also Nos. 8, 511, 576, 654.

358. STARČEVIĆ, J. Racionalizacija unutrašnjeg transporta—poluga za unapređenje proizvodnje. **[Rationalization of inland transport—the lever that raises production.]** *Šum. List* 74 (6), 1950 (242–51). [Croat.]

359. SMYTHIES, B. E. **Timber extraction in the Third Division, Sarawak.** *Emp. For. Rev.* 30 (1), 1951 (47–51 + 10 photos).

Describes various extraction problems, including: (1) use of elephants in hilly country; (2) how to float sinkers down rapids without bamboos (still unsolved); and (3) extraction of logs from freshwater swamps to rail (rolling by hand, hauling on a sledge over rollers).

360. Puutavaran hankinnan koneista ja välineistä. **[Machinery and equipment for logging.]** *Pap. ja Puu* 33 (5), 1951 (189–93). [Fi.e.] P.R.

Contains brief reports, with illustrations, on the Swedish Be-Bo motor saw, a Finnish log-skidding device (the Veto-Veikko) suitable for both summer and winter, a wheel tractor equipped with rubber tracks, a Russian boom coupling lock, and boats equipped with buffers for feeding timber into flumes and sorting enclosures.

372/377. *Land Transport*

361. SUNDBERG, U. Terminalproblem vid motortransport av virke. **[The terminal problem in the motor transport of timber.]** *Svenska Skogsv-Fören. Tidskr.* 47 (6), 1949 (312–29). 30 refs. [Sw.]

Sawtimber averages 5 m. in length and 150–200 (ranging from 50 to 500 or 1,000) kg. per log. Pulpwood may be either of various lengths (2 to 8 or 9 m., average 5·5–6 m.), generally carried with the sawtimber, or of standard lengths (2,3 or at most 4 m.). Figures of volume distribution for sawtimber and pulpwood are shown in graphs and tables. Time taken in handling timber can be divided into 2 parts: the 'time per piece', independent of the size of the timber, and a time in straight-line relationship to the size. The expenditure of time and the cost per unit of volume (shown in graphs and tables) rise at an increasing rate with decreasing average volume. To avoid this, 'time per piece' should be reduced by bundling small timber and by using mechanical aids in loading. The possibility of collecting the timber at large log dumps, where loading can be fully mechanized, is discussed, and examples are given of calculating the added cost per cu.m. taking into account the increased distance of horse-skidding to the log dumps, the rentable value of the site of the dump and the expectation value of the immature trees felled to provide the site. Types of loaders used in Sweden (winch-driven cranes, cable winches, side-loading log flippers, and timber hoists) are briefly described with illustrations, and their suitability under different conditions (e.g. loading of long and short lengths, of posts, and of piece goods other than timber, and loading from both sides of the vehicle or from water to lorry) is summarized in a table based on the results of investigation by the SDA (Föreningen Skogsarbetens och Kungl. Domänstyrelsens Arbetsstudieavdelning).

362. **Handling split truck loads.** *Timberman* 52 (6), 1951 (78).

Haulage by Brown's Tie and Lumber Co., of McCall, Idaho, is carried out in 2 parts, the first part over a private truck road on which big diesel equipment is used, carrying loads heavier than are legally allowed on the public road system. The loads on the big trucks are divided in 2 parts, separated longitudinally by centre stakes. This gives 2 legal-weight loads for lighter equipment. At the end of the private truck road, the half loads are transferred to the lighter vehicles by a Hyster logging arch with Athey wheels, with the addition of 2 separate steel booms each with its own loading line

and sheaves. The equipment used is shown in illustrations.

363. CHAPMAN, H. H. **An ancient and original transportation system for logs in Southern Alabama.** *J. For.* 49 (3), 1951 (209–10).

Describes the construction and operation of flumes used 70–80 years ago for floating Longleaf Pine logs.

364. LEMAY, P. V. **Bundle skidding at Marathon.** *Pulp Paper Mag. Can.* 52 (3), 1951 (256, 259, 261–2).

Bundle skidding using an A-frame and ground lines is preferable to skidding of tree lengths, when snow is on the ground. The same equipment can be adapted for both. Parallel strips are felled, at 90° to the main road, trees are cross-cut into 100-inch lengths and made into stacks, usually of 1 cord, in the centre of and across the strip. A yarder unit consists of 1 yarder and 3 or more lorries, depending on the length of the haul, with a crew of 7 and lorry-drivers. From 3 to 5 loads from the yarder are needed to form a lorry load. Average production for the season is 85–90 cords per 8-hr. day.

365. BLINK, G. C. VAN. Tractoren in tropische bosexploitaties. **[The use of tractors in tropical logging operations.]** *Tectona* 40 (3/4), 1950 (259–318). 17 refs. [Du.du.jav.]

Discusses the question generally, describes American methods of tractor logging, and estimates the relative costs of buffalo and tractor logging in Indonesia.

366. KATO, S. **A study on the calculation of [the strength of] wire-ropes used for skyline skidding.** *Bull. Tokyo Univ. For.* No. 38, 1950 (187–212). 7 refs. [Jap.e.]

367. LEIJONHUFVUD, A. E. Skogsbrukets motortransporter kontra gällande författningar. **[Motor transport in forestry and the present legal prescriptions.]** *Svenska SkogsvFören. Tidskr.* 47 (6), 1949 (295–311). 12 refs. [Sw.]

Discusses the restrictions on wheel pressures on highways in Sweden, road policy and technology, organization of transport, and the use of 6-wheelers or different types of trailer according to the quality of the road and regulations governing its use.

378. *Water Transport*

368. FRÖLICH, M. Die Flösserei in Schweden und Finnland. **[Timber-floating in Sweden and Finland.]** *Schweiz. Z. Forstw.* 102 (5/6), 1951 (257–268 + 4 photos). [G.f.]

369. Kokemäenjoen uittoyhdistyksen vuosikertomus. Vuosi 1946. **[Annual report of the Kokemäki Waterways Floating Association. 1946.]** Tyrvään Kirjapaino Osakeyhtiö, Vammale. 1947. pp. 126 + [4] + 1 map. [Fi.]

Contains a 1/400,000 map of the floating and collecting system of this Finnish association.

370. SINGHAL, R. M. **[Teak] timber floating in Godavari, Indravati and Pranhita Rivers.** *Indian For.* 75 (8), 1949 (1951), (300–1 + 2 photos).

371. PUTKISTO, K. Fullt mekaniserat sorteringsverk. **[A fully-mechanized sorting installation.]** *Svenska SkogsvFören. Tidskr.* 47 (5), 1949 (275–7). [Sw.]

Cf. *For. Abstr.* 11 (No. 2877).

372. KIVELÄ, A., and SAARELA, M. O. Pintavirran kehitin—uittojen tehostaja. **[A surface-current maker—for floating efficiency.]** *Pap. ja Puu* 32 (2), 1950 (59–62). [Fi.] P.R.

After some experimentation the Finnish State Metal Industries have built (1949–50) a compact current-making machine of the propeller type, weighing 900 kg. Powered by an 11-kw. electric motor (1,000 rev./min.), the 60-cm.-diameter propeller turns at 470 rev./min. to produce an exceptionally long and well shaped surface current.

Owing to its high performance, it may be possible to use the machine to replace the far costlier rafting tugs on inland waters. Details of the machine and its use are given in diagrams and illustrations. [Cf. *For. Abstr.* 11 (Nos. 2056, 2881).]

38. FOREST ENGINEERING

See No. 8.

See also Nos. 118–9, 198.

373. CHRISTENSEN, C. M., ANDERSON, R. L., HODSON, A. C., and RUDOLF, P. O. **Enemies of Aspen.** *Lake St. Aspen Rep.* No. 22, 1951. pp. 16.

Enumerates, with brief descriptions, the damage caused to Aspen by fungi, insects, mammals and birds, climatic factors and fire.

374. METCALF, M. E. **Importance and causes of timber mortality in eastern Montana forests.** *Res. Notes Nth. Rocky Mt. For. Range Exp. Sta.* No. 93, 1951. pp. 4.

Data from 2,713 $\frac{1}{5}$-acre sample plots distributed throughout 9·3 million acres of commercial forest land show that annual loss from natural agents is greater than the amount felled for all purposes. Figures showing the mortality in cu. ft. for all trees 5·0 in. d.b.h. and over, and in bd. ft. for sawtimber, are tabulated for the main species (Ponderosa and Lodgepole Pines and Douglas Fir). Lodgepole Pine suffers by mortality the greatest reduction of effective growth, amounting to nearly $\frac{1}{4}$ of the total bd. ft. growth. Classification of loss by causes shows: insects 19%, wind 11%, winter injury 7%, animals (porcupine) 5%, lightning, disease, fire and snow 3%, and unclassified 55%.

41. GENERAL TECHNIQUE OF FOREST PROTECTION

414. *Chemical Control*

See also No. 484.

375. **British insecticides and fungicides for crop protection.** The Association of British Insecticide Manufacturers, London. 1950. pp. 124 + 26. I.F.B.

A directory of Association members, of products and services, and proprietary names and marks, with coloured charts showing stages of bud development in fruit trees and shrubs. The introduction and the directory of products and services are done in 6 languages.

376. COHEN, S. I., *et al.* **Use data on trade name [tree] spray materials.** *Trees, Cleveland, Ohio* 11 (3), 1951 (6–8, 26–8).

Notes by representatives of the manufacturers of Puratized Agricultural Spray, Ammate, Marlate, Fermate, pyrethrum and rotenone sprays, Orthol-K, Volck, Vapotone, Ortho-Mite, Isotox, Orthorix, Wilson's Spred-o-stik, Benox liquid concentrate, and Metacide.

377. MARKE, D. J. B., and LILLY, C. H. **Smoke generators for the dispersion of pesticides.** *Journal of the Science of Food and Agriculture, London* 2 (2), 1951 (56–65). 27 refs. O.R.S.

The optimum mixtures of gas-producing component, sensitizer and pesticide have been investigated. A laboratory method for the biological assessment of the smoke deposits is given. The design of smoke generators is discussed.

42. INJURIES FROM INORGANIC AGENCIES OTHER THAN FIRE

See also No. 424.

421. *Air Currents.*

See also No. 285.

378. HEGER, A. Die Sicherung des Fichtenwaldes gegen Sturmschäden. **[The protection of Spruce forests against storm damage.]** Neumann Verlag, Radebeul and Berlin. 1948. pp. 76. 7 refs. [G.g.] Price *DM*3.85 [10*s.*]

A treatise in 3 parts:—(1) development of methods of protection against storms (including fundamental causes and kinds of damage); (2) an investigation of the best ways of avoiding storm damage; and (3) recommendations for protecting Spruce stands. In general, young even-aged pure Spruce stands can be rendered more wind-firm through intensive tending of the crowns. Mature and maturing stands, however, cannot be stabilized by such means. The author believes that the only way to avoid extensive damage to Spruce is to convert the pure even-aged stands of central Germany, over a period of time, into uneven-aged mixed forest.

422. *Temperature Influences*

See also Nos. 12, 226–8, 286.

423. *Precipitations*

See also No. 226.

379. S., C. L. **Dégâts de neige en Haute Ardenne. [Snow damage in the high Ardennes.]** *Bull. Soc. for. Belg.* 58 (3), 1951 (119–21). [F.]

The coniferous forest of the Ardennes suffered severe damage as a result of the exceptionally heavy snowfall of the winter of 1950–1. Stems broke generally just below the crown or at the level of the lowest green branches; in a few stands, however, for some unexplained reason, breakage occurred much higher up, only 2–3 m. of the crown being broken off. Almost all damage occurred above the 500 m. line. Suppressed trees, and stands with a N. or E. aspect suffered most, and a large proportion of damaged trees were of asymmetrical form. There was little damage in Spruce under 20 years old, and less in widely spaced (1·5 × 1·5 m.) than in more closely spaced Spruce of 20–30 years. Natural stands suffered much less damage than even-aged artificial stands.

380. WATT, R. F. **Snow damage in a pole stand of Western White Pine.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 92, 1951. pp. 4. 2 refs.

Observations of damage during the severe winter of 1948–49 were made on a 2-acre permanent plot and on 17 $\frac{1}{10}$-acre sample plots. On the permanent plot 30% cubic volume, 37% trees and 32% basal area were lost. In the temporary plots, tree loss was only 21%. The smaller trees suffered most; 41% of all trees below 9 in. d.b.h. were killed, and only 31% of trees 9 in. and over. All species (Western White Pine, Grand Fir, Western Hemlock and others) were damaged about equally. Breaking of the bole was more common than uprooting; on the permanent plot, 61% of all fatal injuries were caused by breaking and 39% by uprooting, while for

the temporary plots the figures were 65 and 35% respectively.

424. *Soil Conditions. Erosion Effects*

381. BENVENUTI, B. Effetti da carenza di elementi biogeni su piante di olmo. [**Effects of nutrient deficiencies on Elm plants.**] *Ital. for. mont.* 6 (2), 1951 (66 + 4 photos). [It.f.]

Data from experimental pot culture of *Ulmus campestris* in soils deficient in N, P, and K.

425. *Chemical Influences (Atmospheric)*

382. MARSDEN, D. H. **Gas injury to trees.** *Trees, Cleveland, Ohio* 11 (1; 2), 1950 (6–8, 16–7; 7, 20, 24). 13 refs.

The usual symptoms of injury to trees from broken or leaking gas mains are sudden wilting, discoloured and undersized foliage, dieback, dead buds, and cracking and loosening of bark. Remedial measures, after stopping the leak, are aeration of the soil, fertilizing, watering, and pruning.

383. PESANTE, A. Sopra un caso di daneggiamento della vegetazione dovuto a sostanze catramose. [**A case of damage to vegetation due to tarry substances.**] *Ann. Sper. agr.* (*n.s.*) 5 (1), 1951 (179–200). 11 refs. [It.it.e.] C.G.B.

Describes damage to vegetation caused by fumes from distillation of tar; the tree species affected were Ash, Robinia, Beech, Poplar, Elm, Walnut and Willows; conifers appeared to be unaffected.

43. FOREST FIRES

See also No. 862.

431. *Predisposing Factors and Causes. Fire Danger. Fire Behaviour*

384. DOIGNON, P. Facteurs météorologiques conditionnant les incendies en forêt de Fontainebleau. [**Meteorological factors affecting fires in the forest of Fontainebleau.**] *Rev. for. franç.* 1951 (5), (349–63). [F.]

Gives graphs and tables showing the relationship between climatic factors and fire risk, which is serious between 15 March and the beginning of September, whenever the hygrometer falls below 35%, from 10 a.m. to 6 p.m., from the fourth dry day, when cloud is less than 5/10 and the wind is N.E. and S.E., especially when temperatures, wind strength and rate of evaporation are above normal.

432. *Prevention and Control*

385. MOUTON, G. Lutte contre les incendies en forêt de Fontainebleau. [**Fire-fighting in the forest of Fontainebleau.**] *Rev. for. franç.* 1951 (5), (364–74). [F.]

An account of administration and equipment.

386. PRAX, J. La protection contre l'incendie des reboisements domaniaux du nord-ouest de l'Hérault. [**Protection of state plantations in the N.W. of Hérault against fire.**] *Rev. for. franç.* 1951 (4), (281–91 + 2 photos). [F.]

Reviews the work of the Forest Service in this region, particularly the organization of a look-out system, the practice of early burning, and the acquisition of transport equipment. The virtues of general-purpose vehicles for fire-protection work are stressed.

387. JOHNSON, C. E., and THOMAS, L. R. **The Polaroid camera in fire control.** *Fire Control Notes* 12 (2), 1951 (24–5).

Experiments were conducted during 1950 on the use from the air of the Polaroid land camera (manufactured at Cambridge, Mass.) in forest fire fighting. After exposure, all that is necessary is to push a button, pull out the film strip, wait the required developing time—45 sec. to 3 min., depending on the temperature of the film—open the back of the camera and remove the finished picture, which can then be dropped to the camp or ground crew. The photographs give valuable information on conditions and location of fires and are useful in providing evidence for courts. There is no negative, and additional prints can be obtained only by taking a number of exposures or by copying the original print. The serious weakness disclosed by the experiments was the low shutter speed; turbulent air and the plane's travelling speed may combine to prevent clear detailed pictures. A faster lens should eliminate this fault. The camera with exposure meter costs $100, and black-and-white film $1.70 per roll of 8 pictures, 2¼ × 3¼ in. The loaded camera weighs 4½ lb. and the meter ½ lb. The over-all size is 9½ × 5 × 2½ in.

388. NEUNS, A. G. **Water vs. fire: fighting forest fires with water.** U.S. Forest Service, California Region. 1950. pp. 36.

A popular illustrated account of technique and equipment.

389. BEALL, H. W., LOWE, C. J., and FRASER, D. G. **Chemicals for forest fire fighting: second report.** *For.-Fire Res. Leafl. For. Serv. Can.* No. 5, 1948. pp. 5.

Report on studies made at Petawawa in 1947. [Cf. *For. Abstr.* 11 (No. 1439).]

390. AAMODT, E. E. **Jeep plow.** *Fire Control Notes* 12 (2), 1951 (32–4).

Describes with illustrations the Newgren-Monroe hydraulically controlled fire plough which can be used with any four-wheel-drive vehicle.

391. STILLING, F. I. **Bulldozers for fire suppression in the mountainous terrain of the Northern Rocky Mountain region.** *Fire Control Notes* 12 (2), 1951 (10–8).

An account of organization and techniques, and the personnel required for fire-line construction and mopping-up.

392. KORUNOV, M. M. Primenenie buljdozerov pri tušenii lesnyh požarov. [**Use of bulldozers in forest fire fighting.**] *Lesn. Hoz.* 3 (4), 1950 (65–6). 1 ref. [Russ.]

Briefly describes the successful use of bulldozers for exposing 1-m. strips of mineral soil as fire lines to contain 3 ground fires in Sverdlovsk Province in 1949. About 10 km. of fire line were made; the speed when actually working was 2 km./hr., but allowing for runs involving no fire-line construction the performance is reckoned at about 10 km./machine-day. It is urged that the bulldozer should be the standard machine for such work.

435. *Benefits of Fire Control. Injurious Effects of Fire. Fire Losses*

393. NYGAARD, J. **Forest fire insurance in Norway.** *J. For.* 49 (5), 1951 (337–8).

436. *Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry*

See also Nos. 153, 191, 274.

394. WEAVER, H. **Observed effects of prescribed burning on perennial grasses in the Ponderosa Pine forests.** *J. For.* 49 (4), 1951 (267–71). 6 refs.

395. RAWAT, A. S. **Results of controlled burning in the Sal plantations of Bengal.** *Indian For.* 75 (3), 1949 (1951), (69–86 + 3 photos).

After 15 years of annual burning most of the evergreen ground flora still persisted. Burning did not lessen the number of climbers, though they were slightly less luxuriant on burnt than on unburnt plots, and in one case the cost of climber cutting was significantly reduced, probably because of the mechanical advantage of the cleaner ground. Burning did not produce any beneficial effect on diameter or height growth, and had in fact a somewhat unfavourable effect on diameter growth.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

441. *Weeds*

See also Nos. 191, 230, 256–64, 300, 313–5, 331–8, 376.

396. TISCHLER, N., BATES, J. C., and QUIMBA, G. P. **A new group of defoliant-herbicidal chemicals.** *Proc. Ntheast. Weed Control Conf.* 1950 (51–84). 4 refs. O.R.E.

Experiments at the Sharples Chemicals Inc. laboratories have shown that the 3,6-endoxohydrophthalic acids and their salts, in particular, 3,6-endoxotetrahydrophthalic anhydride (3221), in aqueous solutions possess outstanding herbicidal and defoliant properties. A report on work with these chemicals is presented, with data from typical applications. In miscellaneous tests on woody plants Holly was defoliated, before packing, by spraying with 0·1%, 0·5% and 1% aqueous solutions of the disodium salt of 3441 (i.e. 3504). The plants survived transplanting and quickly resumed growth. Blackberry and Wild Cherry were killed by exposing rootlets and immersing them in (respectively) 0·1% and 0·5% aqueous solutions of 3504. Injection before bursting of the leaf buds, with 10% and 25% solutions of 3504, killed *Datura stramonium* and retarded leaf development in Elms. The same treatment 6 weeks after the opening of the leaf buds, again killed the *Datura*, and, at a concentration of 25%, apparently killed the Elms.

397. HILLI, A. Metsäkasvit ja hormonikäsittely. **[The control of forest weed species with 'hormone' preparations.]** *Metsäk. Aikak.* 1949 (12), (411–4). [Fi.]

Following earlier trials (1943–5) with Fekabit ($KClO_3$), which at 5–10 kg./0·01 ha. completely killed Alder growing in pastureland but also poisoned other vegetation and the soil, various 'hormone' preparations were tried, both as sprays and as dusts. While Alder proved sensitive to all of them, even late in the season, best results were obtained in early summer and with sprays, e.g. 1–2% Weedone or 3–5% Agroxone at 1,000 litres/ha. Extended to Willow along ditches and roads, trials showed Weedone to be the most effective (1% at 1,000 litres/ha.) and dusting to be unreliable. With less windy and wetter weather, results might have been better. Weedone at 200 kg./ha. was effective and equal to 400–500 kg./ha. of other dusts. Damage to ground vegetation was locally severe, especially to sensitive plants such as the Cruciferae and Ranunculaceae; grasses were generally unaffected. Results of Weedone spraying (1948) at the Helsinki University Experimental Farm and elsewhere, on various Cajander forest types, are given in detail. In the 'grove' type, seedlings and saplings of Grey Alder, *Sorbus* and *Betula* were quickly killed, *Vaccinum myrtillus* partially, while young Maple and Spruce were only slightly affected.

398. SUGGITT, J. W. **The control of right-of-way woody growth.** *Proc. 3rd Mtg. east. Sect. nat. Weed Comm. Can.* 1950 (54–8). O.R.E.

A summary of recent trials by the Hydro-Electric Power Commission of Ontario. A 78% kill was obtained 6 weeks after treatment with phenoxy compounds. The effectiveness of ammonium sulphamate increases with concentration, but that of 2,4-D isopropyl ester does not increase within the range 3,500–10,500 p.p.m. Lower concentrations of 2,4-D than 3,500 may be equally effective. Similarly the effectiveness of a combination of 2,4-D and 2,4,5-T seems to increase only slightly with increasing concentrations in the range 2,500–4,000 p.p.m. A list of species and their susceptibility to 4 herbicides is presented.

399. MELANDER, L. W., *et al.* **Résumé of 1949 progress made in research on eradication of woody plants.** *Res. Rep. 6th ann. Nth. Cent. Weed Control Conf.* 1949 (137–78). O.R.E.

[Cf. *For. Abstr.* 11 (No. 2256).] The reports summarized in this section deal largely with experiments by different organizations into the uses of 2,4-D and 2,4,5-T in the control of woody plants, their comparative efficacy and their effects in mixture.

Brush control figures largely among the projects [cf. *For. Abstr.* 11 (No. 3273); 12 (Nos. 695, 1557)]. Combinations of 2,4-D with 2,4,5-T proved effective on some resistant species, such as *Rosa* spp. (*H. E. Wood* et al.) and on *Symphoricarpos occidentalis* and *Elaeagnus commutata* (*H. A. Friesen*). *Rosa pratincola* was successfully treated at Saskatoon with LFN 549, an ester of 2,4,5-T, at rates of 8 oz./acre and upward (*T. K. Pavlychenko*). Dormant-season spraying with 2,4,5-T in fuel oil of (*a*) brush (8,000 p.p.m.) and (*b*) Oak and Maple stumps (4,000 p.p.m.), were promising (*L. L. Coulter*). In Saskatoon good results were obtained with a large variety of woody species by treating them, when in full foliage, with preparations containing the butoxy ester of 2,4-D plus that of 2,4,5-T, the ethyl ester of

2,4-D and the acid of 2,4-D respectively (*T. K. Pavlychenko*). Rates of 1, 2 and 3 lb./acre were used, the susceptible species reacting more or less in proportion to the rates. In tests with a mist sprayer a 50/50 mixture of 2,4-D and 2,4,5-T esters applied in May and again in August was highly successful on a large number of brush species (*O. L. Hoffman* and *E. P. Sylwester*). At Itasca State Park, Minnesota, spraying of Hazel [*Corylus* spp.] brush in July 1949 with 2,4-D almost wiped out *Pinus strobus* seedlings of that year growing beneath it. About 30% of older seedlings also died, compared with 19% on unsprayed plots. Only a very few seedlings germinated on sprayed plots between the original and the second plot counts. The spray may have reduced the viability of the Pine seeds or left toxic and persistent residues in the soil (*H. L. Hansen*). At the Red Plains Conservation Experiment Station, Guthrie, leaves, twigs and stems of *Quercus marilandica* and other Oak brush, when sprayed with mixtures of 2,4-D and 2,4,5-T, accumulated on the soil as a mulch, affording ideal conditions for promoting grass growth (*H. Elwell*).

A number of different experiments on *Symphoricarpos* spp. demonstrated the superiority of 2,4-D sprays over 2,4,5-T sprays for these (*D. L. Klingman*; *V. W. Woestermeyer*; *H. W. Leggett*).

Poison Ivy (*Rhus* sp.) was also successfully treated with foliage sprays of 2,4-D (*V. W. Woestermeyer* and *H. E. Stucky*; *H. L. Hansen*).

In a continuation of experiments on *Maclura pomifera*, greatest destruction of top growth in second-season applications was achieved with 2,4,5-T treatments of 2,000 p.p.m. and over, but most trees sprouted again (*D. L. Klingman*). Similar results were obtained by the Kansas Agricultural Experiment Station on coppicing stumps (*J. W. Zahuley* and *C. L. McCall*). In the former experiments it was observed that toxic quantities of herbicide drifted 5 times as far, when applied in 16 gal. water per acre, as when applied in 160 gal. per acre.

Re-growth from rootstocks of Willow (*Salix interior* var. *pedicellata*) was smallest when standing trees or stumps were sprayed in November with 2,4-D. Helicopter spraying with 2,4-D and 2,4,5-T and combinations of both chemicals, were fairly successful where Willows were thin and not more than about 8 ft. tall. Re-growth of up to 50–55% occurred in other areas [cf. *For. Abstr.* 11 (No. 2257)] (*C. C. Butler*).

Greenhouse experiments on 7½-week-old *Robinia pseudoacacia* seedlings gave 100% kill in less than a week with 800 p.p.m. 2,4,5-T (ester form) at 2 lb./acre. Complete mortality after 30 days was also obtained with 160 p.p.m. 2,4-D (Weedone concentrate No. 48) at 4 lb./acre (*H. L. Hansen* and *J. F. Pelton*).

Unexplained symptoms resembling 2,4-D injury were found on *Acer negundo* over a wide area that could not possibly have been affected by drift from sprays (*W. E. Sackston*).

Near Ely, Minnesota, effects of 2,4-D and 2,4,5-T were tested on Sphagnum moss and Labrador Tea [*Ledum groenlandicum*], important competitors of *Picea mariana* in cleared swamps. The mosses were easily killed by both herbicides. Best results with Labrador Tea were obtained with 2% solutions of Esteron 44 and Esteron 245 in combination, applied at *ca.* 300 gal./acre (*E. L. Roe*).

Tables are included showing the reaction of a large number of woody plants to 2,4-D 2,4,5-T and combinations of both.

400. EGLER, F. E. **Herbicide effects in Connecticut vegetation, 1949.** *Bot. Gaz.* 112 (1), 1950 (76–85). 3 refs. O.B.D.

The 4th report on this project [see *For. Abstr.* 11 (No. 644)] describes *inter alia* experiments with various preparations of 2,4-D and 2,4,5-T esters (separately or together) in aqueous solution, used as foliage sprays, applied to wounds made in stems, and painted or sprayed in winter on stems with bark intact. The advantages of bark treatment were so marked that foliage spraying of woody plants was discontinued in midsummer.

Broadleaved herbs were most easily controlled by spring spraying. The various esters represented in the preparations appeared equal in effect and a concentration of 0·25% entirely adequate. Some herbs required several sprayings. All ferns were comparatively resistant. Blackberries were controlled by cutting in winter and spraying new shoots as they appeared; they were particularly sensitive to 2,4,5-T.

The base of woody plants may be sprayed in winter, and possibly also in summer. Concentrations of 20–25% were highly effective, and concentrations as low as 5–10% might possibly work. Since in some plants there was little downward movement of the killing effect, treatments should be made below the lowermost branches or at least to their bases. Bark sprays, though highly effective, were slow acting, and plants so treated may come into leaf and grow for 5 months after the treatment. Species previously unaffected, e.g. *Picea abies*, *Pinus strobus*, *Kalmia latifolia*, *Juniperus communis* var. *depressa* and *J. virginiana*, now appear to be controllable by a single application.

401. THORNTON, B. J., and BOHMONT, D. W. **Use of growth-regulating compounds in controlling perennial weeds.** *Proc. 12th ann. West. Weed Control Conf.* 1950 (76–88). O.R.E.

A summary of answers to a questionnaire sent out to investigators in the Western States. Reports agree that, for woody plants, foliage applications are only successful when made during the growing season. Large volumes of herbicide carriers are needed, i.e. 80–500 gal. of water or oil/water emulsion per acre, or 2–20 gal. of oil alone. Satisfactory control of Willow with 2,4-D was obtained by applying 8 lb. acid equivalent [per acre?] during the dormant period. Black Willow [*Salix nigra*] trees 40–60 ft. high were killed by boring holes at 6-in. intervals round the base and inserting a teaspoonful of undiluted ester of 2,4-D. With complete foliage coverage, sprays on Willow have been effective at 1,000–1,500 p.p.m. A list of species and effective treatments is appended.

402. NATION, H. A. **Two chemicals appear promising for control of Palmettos.** *Proc. 3rd ann. Sth. Weed Conf.* 1950 (172–4). O.R.E.

Complete kill of *Serenoa repens* was obtained with 90% Na trichloroacetate at the rate of 65 lb./acre. An ester formulation of 2,4,5-T at a rate of 4–5 lb. acid equivalent per 100 gal. water (sprayed until the plants were thoroughly wet) was equally effective.

403. NEVILLE, H. B. **The effectiveness of 2,4-D plus 2,4,5-T on Poison Ivy, Horse Nettle and certain shrubs.** *Proc. Ntheast. Weed Control Conf.* 1950 (259–60). 4 refs. [Long Island Agricultural and Technical Institute, Farmingdale, N.Y.] O.R.E.

The chemical applied at the rate of 2 lb. of the acid equivalent per acre appeared to have killed Poison Ivy [*Rhus toxicodendron*] after a year. Arrow Wood [*Viburnum dentatum*] was also killed; Gray Dogwood [*Cornus racemosa*?] was 90% killed; Ibot Privet [*Ligustrum ibota*] was completely resistant.

404. OFFORD, H. R., and MOSS, V. D. **Spraying *Ribes* by helicopter with 2, 4-D and 2,4,5-T. Killing *Ribes* with 2,4-D and 2,4,5-T.** *Abstrs.* in *Res. Rep. 6th ann. Nth. Cent. Weed Control Conf.* 1949 (152–3). [Division of Plant Disease Control, U.S. Bureau of Entomology.] O.R.E.

Helicopter spraying tests on *Ribes* with 2,4-D were made in California [cf. *For. Abstr.* 11 (No. 3268)] and with 2,4,5-T in Idaho. The latter, applied in water containing 1% summer oil emulsion, was as toxic to *Ribes* and brush as when applied in diesel oil, and was less injurious to conifers. The main conclusions of the 1948–49 experiments were that 2,4,5-T is toxic to *R. acerifolium*, *R. binominatum*, *R. inerme*, *R. lacustre*, *R. laxiflorum*, *R. montigenum*, *R. setosum*, and *R. viscosissimum*, which cannot be killed economically with 2,4-D. With conventional high-volume equipment an aqueous 2,4,5-T spray is effective on these species when it contains 3,000 p.p.m. acid equivalent of the ester plus 10,000 p.p.m. summer oil emulsion. In sprayers with atomizing nozzles 2–3% 2,4,5-T ester in either diesel oil or water containing 2–3% summer oil is also effective. For midsummer spraying of *R. roezlii*, 2,4-D sprays containing the Na salt (500 p.p.m. acid equivalent) plus 10,000 p.p.m. light-medium summer oil emulsion plus 400 p.p.m. sticker-spreader are recommended. Basal stems of *R. nevadense* and *R. cereum* may be sprayed with diesel oil or weedkiller oil containing 50,000 p.p.m. acid equivalent of the ester of 2,4-D or 2,4,5-T. Power mist blowers show promise for treating *Ribes* and brush within 100 ft. of roads with 2,4,5-T concentrate.

405. THIMANN, K. V. **Brush control in Cuba.** *Suppl. to Proc. Ntheast. Weed Control Conf.* 1950 (26–31). 5 refs. [Harvard University, Biological Laboratories.] O.R.E.

For control of *Dichrostachys nutans* certain mixtures of 2,4,5-T with 2,4-D were found to be more effective than either one singly at the same total concentration. In stump painting, stump spraying and foliage spraying, the effect is roughly proportional to the amount of chemical applied. About 600–700 mg. of chemical per plant is needed for a complete kill, and a moderately overgrown pasture would thus require about 3 kg. of chemical per acre The cost is therefore considerable. [Cf. *For. Abstr.* 12 (No. 3364).]

406. BRAMBLE, W. C., and WORLEY, D. P. **Control of Black Locust with chemical sprays.** *Proc. Ntheast. Weed Control Conf.* 1950 (257–8). [Pennsylvania State College.] O.R.E.

Various chemicals and techniques were tested in an old field, on 10- to 15-ft.-high coppice of *Robinia pseudoacacia* from stools 6–8 in. in diameter. A late summer foliage spray with Ammate in 1947 only stimulated coppicing. In June 1948 shoots were cut back to 8 in. and sprays of Ammate (30% solution) and Esteron 44 (2,4-D isopropyl ester) in a 10% aqueous solution and in a 2½% oil solution were compared. All types gave about 60% kill, though abundant coppicing again followed the Ammate treatment. Foliage spraying in August 1948, using a 30% solution of Ammate and 0·4% and 1·0% water solutions of Esteron 44 nearly cleared the field of Black Locust. A complete clearance was achieved by a further spraying in August 1949. Costs are stated.

407. GAMMON, W. M., and BIBBEY, R. O. **The effect of stage of development on the control of Hawthorn (*Crataegus* sp.) with 2,4-D.** *Proc. 3rd Mtg. east. Sect. nat. Weed Comm. Can.* 1950 (52–3). [Ontario Agricultural College, Guelph.] O.R.E.

The Na and triethanolamine salts and the isopropyl ester of 2,4-D respectively gave a satisfactory kill of both top growth and roots, when applied at the flower-bud and full-bloom stages.

408. GERTSCH, M. E., STAMPER, E. R., and RYKER, T. C. **Effect of chemicals on Chickasaw Rose (*Rosa bracteata*).** *Proc. 3rd ann. Sth. Weed Conf.* 1950 (169–71). O.R.E.

The tests, though not conclusive, indicate that the amine salt of 2,4-D in 10% oil is highly effective.

409. JACOBS H. L. **2,4-D, friend or foe?** *Proc. 26th nat. Shade Tree Conf.* 1950 (23–30).

Discussion of injury to neighbouring broadleaved trees from 2,4-D used as a selective weedkiller on lawns. [Cf. *For. Abstr.* 10 (No. 2230).]

410. **[Biological control of *Cordia macrostachya* in Mauritius.]** *Rep. For. Dep. Mauritius 1949*, 1951 (8).

The colonies of the beetle *Schematiza cordiae* released during 1948 [cf. *For. Abstr.* 12 (No. 701)] for the control of the shrubby weed *Cordia macrostachya*, appear to have accommodated themselves to climatic and other conditions in the island and have spread rapidly. Defoliation of *C. macrostachya* now occurs in even the most remote areas and indications are that biological control of this weed will soon be effected.

411. SIMMONDS, F. J. **Further effects of the defoliation of *Cordia macrostachya* (Jacq.) R. and S.** *Canad. Ent.* 83 (1), 1951 (24–7). 4 refs. [Commonwealth Bureau of Biological Control.] O.R.S.

One bush was defoliated once a month, a similar bush had half its leaves removed monthly, and a third was kept as control. In 10 months a very marked restriction in growth and flower formation had resulted from both types of defoliation. [Cf. *For. Abstr.* 10 (No. 2233).]

443. *Fungi and Bacteria*

See also Nos. 92, 375–6, 512.

412. KUJALA, V. Über die Kleinpilze der Koniferen in Finnland: Ascomycetes, *Fungi imperfecti*, Uredinales. [**The microfungi of conifers in Finland: ascomycetes, *fungi imperfecti*, and uredinales.**] *Commun. Inst. for. Fenn.* No. 38 (4), 1950. pp. 121. 106 refs. [G.g.fi.]

Arranged alphabetically in order of species.

413. [JAPAN.] **Fungi inhabiting conifers in the Tôhoku district. 1. Fungi on Sugi (*Cryptomeria japonica* D. Don.).** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 45, 1950 (27–53). [Jap.latin]

Lists 29 species of fungi found on Sugi, describing 19 identified as new species.

414. HATCH, A. B. **Notes on the possibilities of using antibiotics in controlling plant diseases.** *Proc. 26th nat. Shade Tree Conf.* 1950 (91–7). 25 refs.

Summarizes existing literature on successful control of crown gall and *Phytomonas tumefaciens* with penicillin and with streptomycin, of *Venturia inaequalis* with antimycin, and of several mildews with actidione (a fungicidal substance produced by *Streptomyces griseus*); and hitherto unsuccessful attempts to control *Ceratostomella ulmi* with antibiotics, and to find a non-toxic anti-fungal antibiotic substance. [Cf. *For. Abstr.* 8 (No. 2105); 9 (Nos. 2070–1); 10 (No. 693); 11 (Nos. 654–5).]

415. FASSI, B. Prove preliminari sull'azione antibiotica di '*Oospora virescens*' (Link) Wallr. e sulle sue possibili applicazioni pratiche. [**Preliminary tests of the antibiotic action of *O. virescens* and its possible practical applications.**] *Repr.* from *Annali dell'Academia di Agricoltura di Torino 1950–1* 93, 1951. pp. 20. 4 refs. [It.it.e.]

O. virescens, a fungus usually found on decomposing vegetation, dead leaves etc., was isolated, together with other micro-organisms, from cankerous tissue of Poplar infected with 'bacterial' canker, and found to have a markedly fungistatic effect, inhibiting the growth of a number of fungus species. The active principle, which is heat-resistant, appeared to be produced more abundantly by cultures grown on natural media such as carrot or malt-extract broth. Filtrate of *O. virescens* cultures 20 days old reduced spore germination of *Botrytis cinerea*, *Fusicoccum populinum* and *Dothichiza populea* by 90–95%. Direct use of the fungus produced no such inhibiting effect, and there is apparently a great difference in the antibiotic action of various strains. An experiment in the use of *O. virescens* filtrate for the control of *Rhizoctonia solani* damping off of young Poplar seedlings gave promising results (50 plants surviving per seed-box after 10 days for boxes inoculated with *R. solani* and then treated with filtrate of *O. virescens*, compared with none for inoculated but otherwise untreated boxes, and 98 for controls). Research continues.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

416. SIGGERS, P. V. **Spray control of the fusiform rust [*Cronartium fusiforme*] in forest-tree nurseries.** *J. For.* 49 (5), 1951 (350–2).

Sprays containing Dithane 2–78, Ferbam, and Ziram+Santomerse S and Goodrite Type 4 without a spreader, reduced fusiform-rust infection in nursery beds of *Pinus caribaea* and *P. taeda* in 1947 to less than 3% compared with 5% for Bordeaux mixture with Santomerse S and 13·4% for unsprayed controls. Severe damage to seedlings resulted from spraying with Phygon. Delay in the date of sowing reduced the amount of rust. One spraying with Ferbam and Ziram in 1949, applied just before 7 days of cool, moist weather, reduced infection more effectively than 7 subsequent treatments applied during a dry spell. It appears that rust infection may occur as Pine seeds germinate under burlap. *From author's summary.*

417. JOHANNES, H. Ein Pappelsterben in Niedersachsen. [**A lethal disease of Poplar in lower Saxony.**] *Mitt. biol. ZentAnst., Berl.* No. 70, 1951 (45–6). [G.]

Instances some fungus diseases of Poplars in the nursery, particularly one which appeared in Harsefeld in 1950, and which was caused by a hitherto unknown fungus imperfectus, *Septogloeum populiperdum*. Spraying with 2% Bordeaux mixture during the growing season helps to reduce the spread of the disease, but no successful control in already infected trees has been achieved. Resistant species are *Populus* '*grandis*', the Graffhorst Poplar of the *P. gelrica* type and the 'green' form of *P. robusta*.

418. MAHMUD, K. A., and NEMA, K. G. **Collar rot of *Dalbergia sissoo* Roxb. due to *Rhizoctonia* (*Corticium*) *solani* Kuhn.** *Indian For.* 77 (2), 1951 (149).

443.3. Diseases of Older Stages

419. ZYCHA. Akute Probleme der Forstpathologie. [**Acute problems of forest pathology.**] *Mitt. biol. ZentAnst., Berl.* No. 70, 1951 (43–5). [G.]

Cites 3 important diseases of individual species in Germany (*Rhabdocline pseudotsugae* and *Phaeocryptopus gäumanni* on *Pseudotsuga taxifolia*, *Armillaria mellea* on Spruce, and bark disease of Beech) and asserts the importance of dealing with such widespread infections by preventive means.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 228, 743 *et seq.*

420. KAMEI, S. **A heart-rot of conifers caused by *Polyporus borealis* Fr. in Japan.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (155–62 + 3 photos). 18 refs. [Jap.jap.e.]

P. borealis was isolated from heart rot of *Picea glehnii*, and fruiting bodies were later found on the butt of the same tree and on a log at a timber yard near by. The damage does not appear to be serious. *From author's summary.*

421. HUSSAIN, S. M. **Some observations on *Fomes conchatus* (Pers. ex Fr.) Gill.** *Pakistan J. For.* 1 (2), 1951 (148–50 + 1 photo, 1 dgm.). 5 refs.

F. conchatus is a serious heart-rot fungus recorded for the first time in the Patnata forests and Murree Hills, in Pakistan. The nature of its damage is discussed, and methods of control are suggested. *Author's summary.*

422. BLACK, R. L. **Poplar decay study.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (2).

Examination of all merchantable Poplars (*Populus tremuloides*) on 24 sample plots in Ontario showed that the % of trees with decay was low up to 90 years of age, but increased rapidly thereafter, so that almost all trees over 120 years of age had some degree of decay. A rotation of 120 years (felling diameter 13–14 in. o.b.) is suggested for this region. The principal cause of trunk rot was *Fomes igniarius*, and *Radulum casearium* was also commonly encountered. The chief butt rots were *Armillaria mellea*, *Pholiota spectabilis*, *P. adiposa*, and *Collybia velutipes*.

423. RILEY, C. G. **Trunk, butt and root rots of [White] Spruce in the Prairie Provinces.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (3).

Polyporus circinatus and *Flammula connissans* were found to be responsible for more than two-thirds of all butt and root rots of *Picea glauca* in this area.

424. ROBAK, H. Noen iakttakelser til belysning av forholdet mellom klimatiske skader og soppangrep på naletræer. **[Notes on the relationship between climatic damage and fungus attack to conifers.]** *Medd. Vestland. forstl. Forsøkssta.* 8 (2), (No. 27), 1951. pp. 43. 30 refs. [Nor.e.]

A number of trees of *Abies* spp. in the Bergen district suffering from dieback of young branches and tops were examined. *Nectria cucurbitula* was found on the dead bark and isolated from the transition zone between dead and living tissue of recently damaged shoots; on branches with more advanced damage, *N. cucurbitula* was found in association with other fungi. In the damaged branches, the parts adjacent to the dead tissue had a distinct 'frost ring' of parenchyma cells in the beginning of the annual ring formed during the growth season following the time of damage. Meteorological records are against the probability of frost being the primary cause of death, and it is suggested that physiological disturbances caused by the fungal attack render the damaged parts more sensitive to light frosts.

A survey was made over a 7-year period, of damage by *Fomes annosus* to young trees (3–4 years at the first inspection) of *Picea abies*, *Pseudotsuga taxifolia*, *Abies grandis* and *Larix leptolepis*, planted on a site which had been clear felled after a stand of *Pinus sylvestris* had been killed by *F. annosus*. Results of the survey are tabulated, showing the losses caused by *F. annosus* and by other causes, mostly beetle attack. *L. leptolepis* and *A. grandis* appear to be the most and *P. taxifolia* the least resistant to the fungus attack. It is suggested that resistance may be related to provenance, and it appears that some relationship exists between resistance to the fungus and resistance to damage by frost and sun- and wind-burn.

425. DWYER, W. W. JR. ***Fomes annosus* on Eastern Red Cedar in two Piedmont forests.** *J. For.* 49 (4), 1951 (259–62). 6 refs.

Examination of over 10,300 Cedars (*Juniperus virginiana*) in the Duke and Calhoun Forests showed *Fomes annosus* to be a common and sometimes serious pathogen on this species in these areas. The average diameter for all trees affected was 4 in. Trees below 1 in. in diam. largely escaped lethal attack. The Cedar was attacked primarily in Pine forest types but also to varying degrees in hardwood forests. There may be a relation between this distribution and the fact that *F. annosus* occurred commonly on dead Pine roots and stumps; also between *F. annosus* attack and the greater erosion in Pine than in hardwood forests. More diseased trees were found on eroded and gullied Pine slopes than in any other location. Certain soils derived from basic rocks seemed to have a lower incidence of *F. annosus* than soils from acid rocks. The fungus fruited on 15% of the Cedars found to be attacked at Union. Root-to-root transmission and conidial sporulation on litter are other possible means of spread. Only sapwood of Cedar is invaded by the fungus; heartwood contains a principle, presumably associated with Cedarwood oil, that is toxic to it.

Red Cedar approaching post and pole size in the Piedmont region, as exemplified by the two areas studied, can be expected to sustain losses exceeding 10% of the trees. *From author's summary.*

426. RISHBETH, J. **Observations on the biology of *Fomes annosus*, with particular reference to East Anglian Pine plantations. II. Spore production, stump infection, and saprophytic activity in stumps.** *Ann. Bot.* 15 (57), 1951 (1–21 + 1 plate). 14 refs. [Cambridge University.] O.R.E.

Sporophores of *Fomes annosus* are formed on stumps and dying trees throughout the year, provided that the humidity is high enough. Spore discharge also occurs at any time of the year and is not greatly restricted by near-freezing temperatures, though it slows down or even ceases during very dry weather. In the laboratory *F. annosus* basidiospores germinate on freshly cut Pine wood in relative humidity exceeding 92%, but viability is lost rapidly in light at temperatures above 15° C. Under humid conditions *F. annosus* spores will infect freshly cut Pine stumps; spores washed down into the soil remain viable for a short time, and stumps covered with soil are probably infected in this way. The stumps are likely to be attacked for only a few weeks after felling, later colonization probably being prevented by competition from other fungi. *F. annosus* grows in stump roots of Pine at the rate of about 1 m. per year, and so approaches adjacent trees within a year of thinning a plantation. In large stumps the fungus may survive 15 or even 30 years after felling; the infective capacity of stumps is probably greater in alkaline than in acid soils. Competition with other fungi during colonization is discussed. *F. annosus* can grow along roots already occupied by certain fungi, but not along roots occupied by others. The probable course of fungal succession in stumps rotted by *F. annosus* is described. [Cf. *For. Abstr.* 12 (No. 2343).] *From author's summary.*

427. SEMPIO, C. Intorno alle cause della moria dell'abete bianco sull'Appennino toscano e umbro. **[The causes of the disease of *Abies alba* on the Tuscan and Umbrian Appennines.]** *Annali della Facoltá di Agraria, Perugia* 5, 1948 (96–103). [It.]

The immediate cause of disease was infection by *Fomes annosus* and *Armillaria mellea*. The author discusses the possible reasons why these fungi abandon their saprophytic habit and become parasitic, and suggests that one reason may be 'thirst', the relatively moist tissues of the tree providing a reservoir of water.

428. Fernandes, C. Taveira. A campanha contra a 'doença da tinta' dos castanheiros no ano de 1948. **[The campaign against Chestnut 'ink disease' in 1948.]** *Boletim da Junta Nacional das Frutas, Lisboa* 9 (1), 1949 (41–66). 6 refs. [Port.e.f.] [Estação de Experimentação Florestal do Sobreiro.] L.S.

Fungi from Chestnuts suffering from 'ink disease' were isolated for identification, and the results, though inconclusive, incline the author to support Pimentel's view [cf. *For. Abstr.* 12 (No. 728)] that two species are involved, viz. *Phytophthora cambivora* and *P. cinnamomi*. Inoculation trials with different tree species showed that, although there is little difference, among the type of fungi isolated, between the *P. cinnamomi* and the *P. cambivora* groups, the latter are less virulent than the former. *Castanea* is by far the most susceptible of the species tested, while *Juglans regia* is very resistant. The results of tests for resistance to 'ink disease' of various strains of *C. sativa*, some natural hybrids, and hybrids from crosses with *C. crenata*, are given. A short survey is also presented of assistance given to public and private bodies, and control measures undertaken in the north of Portugal, where good results were obtained with Cu preparations. [Cf. *For. Abstr.* 13 (No. 182).]

Wilts, Diebacks etc.

See also Nos. 272, 489.

429. Pomerleau, R. Rapport général des travaux effectués sur la maladie hollandaise de l'orme dans la province de Québec en 1949. **[General report on research into Dutch Elm disease carried out in Quebec in 1949.]** Service forestier, Ministère des Terres et Forêts, Québec. [1950?]. pp. 29 + 1 photo, 8 dgms. [F.]

430. Swingle, R. U. **Report on research on the Dutch Elm Disease.** *Proc. 26th nat. Shade Tree Conf.* 1950 (38–42).

Soil applications of aluminium sulphate, hydrated lime and Carolate had no apparent effect on the amount and intensity of infection of Elm trees artificially inoculated with *Ceratostomella ulmi* after treatment.

One of 11 vegetatively propagated 'Christine Buisman' Elms [*U. carpinifolia*], supposed to be immune to Dutch Elm disease, developed mild symptoms of it. Investigations in progress indicated that a strain of *C. ulmi* unusually virulent to the Buisman Elm had developed and was responsible for the symptoms.

431. Liming, O. N., Rex, E. G., and Layton, K. **Effects of a source of heavy infection on the development of Dutch Elm disease in a community.** *Phytopathology* 41 (2), 1951 (146–51).

A single infected tree from which bark beetles were allowed to escape, constituted a source of infection for many trees near by, but the menace of infection was largely spent at a distance of 800 ft. Natural factors appear to have prevented the disease from becoming epidemic over the whole area studied.

432. Bretz, T. W. **Oak wilt [*Chalara quercina*, in the U.S.A.].** *J. For.* 49 (3), 1951 (169–71). 12 refs.

Describes the disease and its spread, and reviews some of the literature on the subject.

433. Ito, K. **Contributions to the diseases of Poplars in Japan. I. Shoot blight of Poplars caused by a new species of *Pestolotia*.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 45, 1950 (135–46). 27 refs. [E.e.jap.]

Wilting of the current year's shoots of *Populus nigra* planted in shelterbelts and windbreaks has been caused by *Pestalotia populi-nigrae* (sp. nov.). Inoculation experiments showed that the fungus cannot attack through healthy bark, but develops rapidly through wounds, especially wounds caused by burning. *P. nigra* is very susceptible to attack, *P. monilifera* and *P. simonii* moderately susceptible, and *P. maximowiczii* resistant.

434. Příhoda, A. Keřovitý růst lipových sazenic jako následek napadení hubou *Pyrenochaeta pubescens* Rostr. **[Bush-like growth of Lime plants as a result of attack by *P. pubescens*.]** *Repr.* from *Ochrana Rostlin, Praha* 23 (4), [1950]. pp. 2. [Cz.cz.russ.f.] X.

Description of a case in which *Pyrenochaeta pubescens* caused the twisting and drying-up of young shoots of Lime. Thus only the lower buds developed, and formed a new crown. The same phenomenon was repeated over several years, giving rise to a bush-like habit. Appropriate pruning transformed the deformed trees into normal ones.

Cankers, Stem Rusts etc.

435. Sempio, C. Spaccature corticali dell'abete bianco. **[Cracks in the bark of *Abies alba*.]** *Annali della Facoltà di Agraria, Perugia* 5, 1948 (41–50). [It.]

In 1938 many Fir trees in the Apennines, between Pistoia and Modena, were observed to have cracks in their bark ranging in length from 20 cm. to more than 1 m. and in width from a few mm. to 2·5 cm. Later, the needles of the affected trees became discoloured and eventually fell. The trees recovered in the following year and the cracks were eventually covered over by callus. Possible causes (frost, rapid changes of temperature, very rapid diameter growth, and drought) were investigated and eliminated. Examination of the bark, and especially of the secondary phloem and parenchyma, adjacent to the cracks, revealed the frequent presence of a septate, sterile, olive-coloured mycelium not much ramified, which did not penetrate beyond cortical parenchyma cells. This mycelium, when cultured on agar, generated conidia of *Alternaria*, and inoculation of healthy trees produced typical cracks in the bark.

436. Grasso, V. Un nuovo agente patogeno del *Cupressus macrocarpa* Hartw. in Italia. **[A new**

pathogen [*Coryneum cardinale*] of *Cupressus macrocarpa* in Italy.] *Ital. for. mont.* 6 (2), 1951 (62–5 + 7 photos). 8 refs. [It.it.f.e.]

Cf. *For. Abstr.* 9 (No. 2541).

437. CARTER, J. C. ***Cytospora* canker [in the U.S.A.]** *Proc. 26th nat. Shade Tree Conf.* 1950 (44–50). 11 refs.

Cytospora kunzei canker of Spruce and Douglas Fir causes serious damage to affected trees. On *Populus nigra* var. *italica* and *P. simonii*, *C. chrysosperma* is so widespread and destructive that their use as ornamental trees is doubtful; it is also very destructive to Caroline and Silver-leaf Poplar in dry regions. *C. cenisia littoralis* canker of *Cupressus sempervirens* is limited to the coastal area of central and south California, where it is causing serious losses. The remaining *Cytospora* diseases cause considerable damage to weakened and injured trees, but rarely develop as virulent parasites on healthy trees.

438. RIBALDI, M. Su un caso raro di citosporiosi del *Cedrus libani* da *Cytospora cedri* Syd. et Butler—India. **[A rare example of cytosporiosis of *Cedrus libani* due to *Cytospora cedri*.]** *Annali della Facoltà di Agraria, Perugia* 5, 1948 (146–55). [It.it.]

Cytospora cedri, first described in India in 1916, and apparently not recorded since then, was identified in 1944 at Perugia on the trunk of a dying Lebanon Cedar. The microscopic and cultural characters of the fungus are now described more accurately.

439. ŠEBENIK, M. Rak kostanjeve skorje (*Endothia parasitica*) in bodočnost kostanjevih sestojev. **[Chestnut blight and the future of Chestnut stands.]** *Gozd. Vestn.* 9 (1/2), 1951 (37–9). 2 refs. [Sloven.]

Disease of *Castanea sativa* near Nove Gorice (Gorizia) and in a state forest near Vipava (Wippach) was identified as due to *Endothia parasitica*. The disease seems to have begun some 10–12 years earlier, simultaneously with its appearance in the Videm (Udine) area.

440. BIRAGHI, A. *Endothia parasitica* e gen. *Quercus*. **[*Endothia parasitica* and the genus *Quercus*.]** *Ital. for. mont.* 6 (1), 1951 (15–6 + 2 photos). [It.it.f.e.]

Cf. *For. Abstr.* 12 (Nos. 727, 1576).

441. SLIPP, A. W. **Growth rate of cankers of White Pine blister rust along branch leaders toward the trunk in Western White Pine.** *Res. Note For. Exp. Sta. Idaho* No. 1, 1951. pp. 3 + 2 gphs.

Results of analyses, based on 10 years' records, of rate of growth toward the trunk in 808 blister-rust cankers established by inoculation on branch leaders of *P. monticola*, are shown in graphs and discussed. The relationship between growth rate and diameter of branch is curvilinear, but growth prediction is not reliable for individual cankers or small numbers of cankers. Canker growth is more rapid on 'flagged' branches (with the tip of the branch dead beyond the canker) than on unflagged. There is a curvilinear relationship, similar to that between canker growth rate and branch diameter, between canker growth rate and canker age. On an average, 20·1% of annual canker growth occurs between early October and early May, the % increasing with increasing branch diameter.

442. STRUCKMEYER, B. E., and RIKER, A. J. **Wound-periderm formation in White Pine trees resistant to blister rust.** *Phytopathology* 41 (3), 1951 (276–81). 8 refs.

Describes the anatomy of the wound periderm in *Pinus strobus* resistant to *Cronartium ribicola*, that had been artificially and severely inoculated with the fungus 4 years before the study.

Foliage Diseases

443. YARWOOD, C. E. **Defoliation by a rain-favored and a shade-favored disease.** *Phytopathology* 41 (2), 1951 (194–5). 6 refs.

Describes briefly the pattern of defoliation in trees caused by (1) imperfect fungi, the spores of which are carried principally by rain, and which spread downwards from the top of the tree, (2) uredial stages of rusts, which are more abundant in the absence of rain than in its presence, but need free water for spore germination and are therefore to be found mainly on dew-collecting surfaces, and (3) powdery mildews, which are favoured by shade and dry weather, and are commonly found on the lower and inner leaves of tree crowns.

444. PŘÍHODA, A. Nová choroba borového jehličí v Čechách. **[A new disease of Pine needles in Bohemia.]** *Repr.* from *Ochrana Rostlin, Praha* 23 (4), [1950]. pp. 4. [Cz.cz.f.] X.

A new disease of *Pinus aristata* in central Bohemia, characterized by the drying-up of needles, is caused by a fungus, as yet not completely identified, but most resembling *Stagonospora pini*. Its conidia are shorter than those of *S. brunchhorstii*.

445. RIBALDI, M. Su di un seccume delle foglie dell' *Acer negundo* dovuto a *Macrophoma negundinis* nov. sp. **[A leaf disease of *Acer negundo* caused by *Macrophoma negundinis* sp. nov.]** *Annali della Facoltà di Agraria, Perugia* 5, 1948 (165–9). [It.it.]

45. DAMAGE BY ANIMALS

451. *Mammals*

See also Nos. 54, 265, 276–7.

446. OBERDORFER, E. Die Schafweide im Hochgebirge. **[Sheep grazing on mountain ranges.]** *Forstwiss. Cbl.* 70 (2), 1951 (117–24). [G.]

Discusses and describes in detail the influence of grazing on vegetation in Allgäu.

447. MAKI, T. E., and MANN, W. F. JR. **Some effects of sheep grazing on Longleaf Pine.** *J. For.* 49 (4), 1951 (278–81).

Cf. *For. Abstr.* 10 (No. 2256).

448. ENGLUND, S. Vildkaninen, den gotländska skogens 'fiende nummer ett'. **[The wild rabbit, 'enemy number one' of the forests of Gotland.]** *Från Skogsvårdsstyrelsernas arbetsfält* 1949 (13–20)—*Suppl* to *Svenska SkogsvFören. Tidskr.* 47 (2), 1949. [Sw.]

Gives an account of the spread of rabbits through the island since their introduction in 1902, and of

their present distribution, with methods, not so far very successful, of control by poisoning, trapping, shooting, etc.

449. PETERSEN, B. B. Egernskrælning på bøg og lærk. [Squirrel barking of Beech and Larch.] *Dansk Skovforen. Tidsskr.* 35 (6), 1950 (299–309). [Dan.]

Describes some few cases in Denmark, where this type of damage has been very uncommon, making passing reference to experience elsewhere as a warning that such damage can be severe. As squirrels are increasing in Denmark, the situation needs watching.

450. STOECKELER, J. H., and HEINSELMAN, M. L. Deer damage may be reduced by use of repellents. *Tech. Note Lake St. For. Exp. Sta.* No. 355, 1951. p. 1.

Figures are given showing the considerable reduction in browsing when a one-year-old plantation of White Pine was sprayed with a commercial repellent containing Zn dimethyl dithiocarbamate cyclohexylamine with polyethylene polysulphide as adhesive. Spraying, using 1 lb. repellent to 2·5 gal. water, was particularly effective if done in September.

451. ADAMS, L. White-tailed deer browsing on Ponderosa Pine plantations. *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 89, 1951. pp. 5. 1 ref.

Figures of browsing damage from 1947 to 1950 to Pine seedlings planted on fenced and unfenced plots are tabulated. The trees on fenced plots showed comparatively good survival, although damaged fences allowed some deer to browse. The experiment has shown that deer eat Ponderosa Pine seedlings to the extent of becoming a primary limiting factor in their survival. There is also evidence that the Pine is to some extent an item of starvation diet, and that an improvement in the more palatable deer range plants would reduce browsing on Pine seedlings. [Cf. *For. Abstr.* 11 (No. 3313).]

452. Bear facts committee finds stripping bad. *J. For.* 49 (5), 1951 (382).

A committee of the local branch of the Society of American Foresters has investigated damage by black bears in the Puget Sound area. More than 11% of Douglas Firs from 3 to 24 in. in d.b.h. on an 1,880-acre tract were found to have been injured. Bears strip the bark from the trees, apparently in order to lick the sap from the inner bark and exposed wood. Injury varies from removal of a small patch of bark to complete girdling, and may occur on any part of the stem from the base to as high as 50 ft. All species of conifer are attacked, but there seems to be a decided preference for Douglas Fir.

453. [Protection of Pine plantations from monkey damage.] *Rep. For. Dep. Mauritius 1949*, 1951 (8).

The generally dense undergrowth of Pine plantations in Mauritius favours the depredations of monkeys, which strip off the young bark. Plantations in which undergrowth is controlled by periodic cutting suffer no damage.

454. DOVER, A. Fence maintenance. *Quart. J. For.* 45 (2), 1951 (137).

The life of wire netting can be increased from 7 to 25 years by brushing with coal tar at a cost of *ca.* £1/100 yd., every 3 years. The method of application is described.

453. *Insects*

See also Nos. 375–7.

455. NEVES, C. M. BAETA. Da entomofauna florestal portuguesa—Apterygota e Pterygota (Exopterygota). [Forest insect fauna of Portugal—Apterygota and Pterygota (Exopterygota).] Imprensa Libânio da Silva, Lisbon. 1950. pp. 110. Numerous refs. [Port.]

A thesis presented to the Portuguese Instituto Superior de Agronomia, and consisting of (1) a list of Portuguese species with ecological notes, and (2) a discussion of the type and extent of damage caused in Portugal by the most important species.

456. RIMSKIĬ-KORSAKOV, M. N., and GUSEV, V. I. [Editors]. Lesnaja èntomologija. [Forest entomology.] Goslesbumizdat, Moscow and Leningrad. 3rd ed. (rev.) 1949. pp. 507 + 4 coloured plates. 19 pp. of refs. [Russ.] Price *Roubles* 18.30.

This textbook is intended for forestry schools of university standard. As 11 years had passed since the issue of the previous edition, many changes were necessary. After a general outline of the development of forest entomology in the U.S.S.R., there are chapters on: (1) The course presented and method of study. (2) Structure and functions of insect organs (pp. 21–65). (3) Development and reproduction (pp. 66–90). (4) Classification (pp. 91–9). (5) Ecological factors (pp. 100–28). (6) Importance of insects to forestry (pp. 129–43). (7) Control measures, with a brief section on the organization of forest protection in the U.S.S.R. (pp. 144–210), The remaining chapters contain special accounts of all important species and their control, under the headings:—(8) and (9) Primary and secondary pests of mature and middle-aged forest (pp. 211–341). (10) Pests of young forest (pp. 342–67). (11) Root pests (chafers) (pp. 368–89). (12) Nursery pests (pp. 390–6). (13) Pests of fruits and seed (pp. 397–412). (14) Pests causing technical damage to standing and converted timber (pp. 413–30). (15) Shelterbelt pests (pp. 431–59). (16) Useful insects (parasites and predators) (pp. 460–73).

There are numerous illustrations, a 19-page bibliography classified by chapters, and indexes to Russian and scientific names of insects.

457. ROONWAL, M. L. Errata to C. F. C. Beeson's (1941) book: 'The ecology and control of the forest insects of India and the neighbouring countries'. *Indian For.* 77 (2), 1951 (118–23).

Cf. *For. Abstr.* 5 (p. 24).

458. QADRI, M. A. H. Some of the important forest pests of the north-western Himalayas during 1950. *Pakistan J. For.* 1 (1), 1951 (67–73). 6 refs.

Notes from the author's recent survey.

459. PREBBLE, M. L. *et al.* Forest entomology in relation to silviculture in Canada. *For. Chron.* 27 (1), 1951 (6–37). 129 refs.

A review of work during the past 40 years, comprising: (1) A review of general principles (*M. L. Prebble*); (2) Dieback of Birch (*R. E. Balch* and *G. W.*

Barter); (3) The Spruce budworm problem (*M. L. Prebble* and *R. F. Morris*); (4) The Larch sawfly problem (*R. R. Lejeune*); (5) The Mountain Pine beetle (*G. R. Hopping*); (6) The Hemlock looper problem in British Columbia (*H. A. Richmond and J. M. Kinghorn*).

460. MACKENZIE, J. M. D. **Control of forest [insect] populations.** *Quart. J. For.* 45 (2), 1951 (95–102). 12 refs.

The mechanism by which forest populations, mostly insects, are controlled is thought to be multiple, the importance of various agencies varying at different times and densities, but all being to a great extent interdependent. Purely mathematical theories do not seem to cover all the known facts, perhaps because they are based on random search, and birds and mammals—two agencies which are effective at low and medium densities of their prey—employ various means to avoid competition and randomness. As a controlling factor birds, for instance, may be density-dependent within certain prey-density limits. Some papers with a bearing on control are discussed. *From author's summary.*

461. **Insectivorous birds [in S. African Wattle plantations.]** *Rep. Wattle Res. S. Afr. 1950*, 1951 (30).

Observations on birds that destroy adults, larvae, or whole bags of the Wattle bagworm (*Acanthopsyche junodi*). [Cf. *For. Abstr.* 13 (No. 473).]

462. BOBACK, A. W. Die Bestandsänderung der Waldvogelwelt durch Krieg und Kriegsfolgen und der forstliche Vogelschutz. **[Changes in forest bird population through war and its consequences, and forest bird protection.]** *Anz. Schädlingsk.* 24 (3), 1951 (40–2). 5 refs. [G.]

Discusses reasons for the diminishing number of birds in the German forests and recommends the placing of nesting boxes and the reservation of sufficient underwood to encourage nesting.

Hemiptera

See also Nos. 41, 130.

463. VISWANATHAN, T. P. **A preliminary note on the occurrence of a species of *Helopeltis* (Capsidae, Rhynchota) on nursery seedlings.** *Indian For.* 75 (5), 1949 (1951), (167).

Helopeltis aff. *antonii* is causing serious damage to nursery seedlings of *Terminalia tomentosa* and *Lagerstroemia flos-reginae* in Travancore.

464. RAPPARD, F. W. Bladluis op djati. **[Aphids on Teak.]** *Tectona* 40 (2), 1950 (160–2). 5 refs. [Du.e.]

Aphis tectonae v.d.G. is synonymous with *A. gossypii* Glov. Damage is on the whole very slight, but severe infestation of the underside of half-grown leaves will cause them to shrivel.

465. BURSCHEL, P., and VITÉ, P. Neue Beobachtungen über die Buchenblattbaumlaus *Phyllaphis fagi* L. (Hem., Aphididae). **[New [biological] observations on *P. fagi*.]** *Forstwiss. Cbl.* 70 (3), 1951 (181–6). 19 refs. [G.]

466. PETERSON, L. O. T. **Control of the Pine needle scale [*Chionaspis pinifoliae*] in the Prairie Provinces.** *Procd. Publ. Div. Ent. Dep. Agric. Can.* No. 121, 1950. pp. 4.

467. DINTHER, J. B. M. VAN. Morphologie en biologie van de schildluis *Chionaspis salicis* L. **[Morphology and biology of *C. salicis*.]** *Tijdschr. PlZiekt.* 56 (3), 1950 (173–252). 117 refs. [Du.e.] E.M.B.

The biology and morphology of *C. salicis*, its natural enemies, and methods of control, are discussed in detail, and its distribution, host plants and economic importance more briefly. In Holland, the insect is found mainly on Willows, and sometimes on *Populus alba* and *Alnus glutinosa*, generally when these are near infested Willows. Bark from *Salix alba* and *S. viminalis* with eggs and insects was transferred to trees and shrubs, 2–3 years old, of 22 species known to be attacked in other countries; the life cycle was completed only on *Populus* spp. Natural control by parasites, birds and insect predators is inadequate. Investigations during 1949 showed that *ca.* 14% of the insects on infested Willows were parasitized by *Aphelinus fuscipennis* and *ca.* 1% by *Chiloneurinus microphagus*. About 10% were destroyed by birds during the autumn and winter, and *ca.* 1% of the eggs by a mite, *Tyrophagus dimidiatus*. Measures suggested for control are the removal, where possible, of heavily infested branches; and a winter spray, as late in the season as possible, with 4% mineral oil.

Lepidoptera

See also Nos. 42–4.

468. CAMPBELL, D. K. **A needle miner infesting Lodgepole Pine near Squilax B.C.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (1), 1951 (4).

Identified as a species of *Recurvaria*, closely resembling *R. milleri*, but differing in several respects in its habits and life history.

469. VIVES COMALLONGA, L. V., and BARDÍA BARDÍA, R. La *Evetria* (*Tortrix*, *Retinia*) *buoliana* Schiff., sobre *Pinus insignis* Douglas. **[*E. buoliana* on *P. radiata*.]** *Publicaciones del Instituto de Biología aplicada, Barcelona* 5, 1948 (1949), (113–21 + 13 photos). 11 refs. [Span.span.e.]

Some observations on *Pinus radiata* in Spain and on *Evetria buoliana*, an important pest of the Spanish stands. Control is usually effected by cutting and burning infested buds. Affected leaders can be preserved by extracting the larvae and tying the leader to a stick to prevent its deformation. Where the pest causes great damage the mixing of broadleaved species with the conifers is recommended. [Cf. *For. Abstr.* 8 (No. 2129).]

470. DOWDEN, P. B., CAROLIN, V. M., and DIRKS, C. O. **Natural control factors affecting the Spruce budworm in the Adirondacks during 1946-1948.** *J. econ. Ent.* 43 (6), 1950 (774–83). 7 refs.

Sample plots were established during the outbreak, and biological data from observations made from 1946 to 1948 are presented. The infestation had almost completely subsided by 1948, without causing any serious tree mortality. The natural factors responsible for the decline were overwintering mortalities (75–80%), parasites and birds. Parasitization was high, and 16 species of parasite are

isted, 8 of which are new for Spruce budworm. The effects of insectivorous birds were not accurately stimated, but they may be responsible for much of he mortality credited to unknown factors. The xact nature of the environmental conditions that avoured natural control factors during the outbreak emains obscure.

471. BERGOLD, G. H. **The polyhedral disease of the Spruce budworm, *Choristoneura fumiferana* Clem.) (Lepidoptera: Tortricidae).** *Canad. J. Zool.* 9 (1), 1951 (17–23 + 3 photos). 18 refs. P.R.

In investigations of the polyhedral disease of the Spruce budworm, the polyhedral bodies have been purified and the isolated virus rods described. Quantitative infection tests indicate a high resistance or immunity of the insects against the virus. Some remarks are made regarding epizootiology. *Author's summary.*

472. BASHAM, J. T. **Deterioration of Balsam Fir killed by the Spruce budworm.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (2).

Examination of budworm-killed stands of Balsam Fir in Ontario showed that almost all decay was due to 4 species of fungi, namely *Polyporus abietinus*, *Stereum chailletii*, *Fomes pinicola*, and *Coniophora puteana*. Of these, *P. abietinus* is the most important, accounting for 92·4% of the advanced sap rot in the trees dissected. No significant decay was present in the first year after death, but by the end of the 3rd year more than 40% of merchantable volume was decayed.

473. **Chemical control [of Wattle bagworm].** *Rep. Wattle Res. Inst. S. Afr. 1950*, 1951 (26–7).

Experiments in the use of BHC and Toxaphene for the control of the Wattle bagworm [*Acanthopsyche unodi*] using a Todd Insecticidal Fog Applicator ('Tifa') [cf. *For. Abstr.* 12 (No. 635)] gave good kills within 6 days of application. Re-examination of the sprayed plots 5–7 months later showed that a further kill, amounting to 2·5–21·4% increase over natural mortality, had occurred since the earlier assessment. When using these insecticides in experimental plots in the future, assessment of mortality will be made after 1 and 2 weeks and thereafter at monthly intervals up to 6 months after spraying. [Cf. *For. Abstr.* 13 (No. 461).]

474. SCHWERDTFEGER, F. Kampf dem Kiefernspinner. Einführung in die Lebensweise und Bekämpfung des Kiefernspinners (*Dendrolimus pini*). [**Control of Pine moth. An introduction to the life history of *D. pini* and control methods.**] Neumann Verlag, Radebeul and Berlin. 1949. pp. 40. [G.] Price *DM*1.80 [4*s.* 6*d.*].

475. MACLEOD, D. M. **Fungous diseases of the forest tent caterpillar [*Malacosoma disstria*].** *Bi-m. Progr. Rep. Div. For. Biol. Agric. Can.* 7 (1), 1951 (2).

Three species of fungus caused disease to *M. disstria* in Ontario in 1950—*Beauveria bassiana*, *B. globulifera* and *Empusa* sp.

476. BERGOLD, G. H., and MCGUGAN, B. M. **Virus diseases of forest tent caterpillar [*Malacosoma disstria*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (1), 1951 (2–3).

A polyhedral virus disease was found in caterpillars of *Malacosoma disstria* at a number of widely scattered points in Ontario.

477. SMITH, C. C. **Control of forest tent caterpillar, *Malacosoma disstria* Hbn., with DDT.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (1).

Complete control can be obtained by spraying trunks and foliage thoroughly within 10 days after the bursting of the buds, using DDT in wettable powder form or in emulsion at 2·5 lb. actual DDT to 100 gal. of spray.

478. GREEN, G. W., and SULLIVAN, C. R. **Ants attacking larvae of the forest tent caterpillar, *Malacosoma disstria* Hbn. (Lepidoptera: Lasiocampidae).** *Canad. Ent.* 82 (9), 1950 (194–5). [Forest Insect Laboratory, Sault Ste. Marie, Ont.] O.R.S.

During field studies of the larvae on small *Populus tremuloides* trees, 2 species of ant (*Camponotus herculeanus ligniperdus* and *Formica fusca*) were found frequently attacking the smaller larvae. There were 2 types of attack: (1) by foraging ants, mainly *Camponotus* workers, which persistently carried off larvae in any stage of development from the first to the fourth instar. These attacks decreased in the spring of 1950, which was a much wetter season than the previous one; (2) by defenders of aphid colonies, where the young larvae were moving about the trees to feed or moult. This type of attack took place both in 1949 and in 1950. Larger larvae were driven off but not killed.

479. DOBROVOLJSKIĬ, B. V. Koljčatyĭ šelkoprjad na Donu i Severnom Kavkaze. [***Malacosoma neustria* in the Don region and the northern Caucasus.**] *Lesn. Hoz.* 3 (3), 1950 (90–1). [Russ.]

Notes on life cycle, natural enemies, food plants and control of this moth, which is one of the most frequent and serious pests of orchards and hardwood forest stands in the region. Chemical control measures recommended include dormant spraying with 5% oil emulsions to destroy the eggs, and dusting with 'DDT-7' (15–20 kg./ha.) or Ca arsenate (10–15 kg./ha.) against the young larvae. For the latter purpose sprays of Ca arsenate or Paris green [formulations given] can also be used. Chemical control measures should start early, as otherwise defoliation will occur; the older larvae, moreover, are less susceptible to DDT. It is urged also that greater efforts should be made to protect insectivorous birds and to attract them into the stands.

480. [DUBOIS.] Une invasion de chenilles sur *Millettia* à Léopoldville. [**An infestation of caterpillars [of *Rhopalocampta libeon*] on *Millettia* [*laurentii*] at Léopoldville.**] *Bulletin du Cercle zoologique congolais* 20 (1), 1950 (28–9). [F.] (*Suppl.* to *Rev. Zool. Bot. afr.* 20 (2/3), 1951.)

The trees were completely defoliated.

481. PETERSON, L. O. T., and HAMMOND, F. R. **Control of the fall cankerworm [*Alsophila pometaria*] in farm shelterbelts in the Prairie provinces.** *Procd. Publ. Div. Ent. Dep. Agric. Can.* No. 122, 1950. pp. 4.

482. HEQVIST, K.-J. Om bokspinnarens (*Dasychira pudibunda* L.) uppträdande i Halland år 1946. [***D. pudibunda* in Halland in 1946.**] *Svenska SkogsvFören. Tidskr.* 47 (4), 1949 (219–27). 26 refs. [Sw.g.]

The attack was confined mainly to 75- to 120-year-old Beech stands, spreading rapidly outward from points of attack. Mortality among the larvae was heavy, probably because the wet weather encouraged disease. Two parasites, *Automalus alboguttatus* and *Cratichneumon sicarius* were present in large numbers. There was no sign of a further outbreak in 1947, and, although the stands had been left leafless, no evidence that yield had been reduced. Other trees attacked included Oak, Birch, Alder, and Spruce.

483. NAUDE, T. J. **Entomological problems in the Union.** *Fmg. S. Afr.* 25 (297), 1950 (478–85). E.M.B.

The report includes a section on pests of forest trees. Numerous natural enemies of *Euproctis terminalis* were found in S. Africa during the year 1949–50. The tachinid parasite *Compsilura concinnata*, introduced from Canada in 1944, was proved to be established, and the list of parasites now includes a number of Hymenoptera and Tachinidae. A fungus, *Isaria formosa*, has been recorded from the pupae, and a *Gregarina* from the alimentary canal of the larvae. Newly established host plants of the pest include *Dombeya pulchra*, *Rhus dura* and *Solanum giganteum*.

484. [THIEMANN.] **Toxic fog in anti-parasite work.** *Emp. For. Rev.* 30 (1), 1951 (72–4 + 2 photos).

Part résumé and part translation of an article in *Holz-Zentralblatt* 12.9.50, describing the use of a Lister-Todd spraying machine against nun moth in Weiden Forest, Bavaria. The machine was mounted on a specially built trailer which can take two drums of solution and still leave room for the operator. When working, it emits a thick fog extending for several hundred metres, capable of hovering for a long time and slowly depositing a fine film of oil against all resistance. Thorough tests showed that 0·5 kg. pure chemical (e.g. DDT) per ha., when the fog was properly spread, gave almost 100% kill compared with 2·5 kg. needed for dusting. To give a safe margin for air movements etc. a dosage of 0·8–1 kg. pure chemical or 8–10 kg. solution /ha. is recommended. 'Fogging' should be done in early morning or late evening. The need of studying air movement is stressed. Costs are much below those for all methods hitherto tried. The cost of insecticide is about *DM*18·8/ha. compared with *DM*38 for dusting, and the outlay on fuel, wear and tear of the machine, and staff, is also far below that for a motor duster or an aircraft. In the experiments reported, the gross costs per ha. were *DM*21 for fogging and *DM*46 for dusting, while the costs of aerial dusting or spraying would be *ca. DM*100. As the machine can be operated almost exclusively from the rides, it can treat 5–6 times the area in the same time as a motor duster which has to make its way into the midst of plantations. An additional advantage of fogging is that very little poison falls on the ground, so that there is little interference with soil fauna.

Coleoptera

See also Nos. 46–9, 265, 299.

485. SMITH, C. C., and BARTER, G. W. **Effectiveness of DDT against the bronze Birch borer, *Agrilus anxius* Gory.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (1), 1951 (1).

Experimental spraying of White Birch girdled in the spring (a treatment that has always produced borer attack) indicated that adequate protection can be obtained if the whole tree is thoroughly sprayed twice with DDT at a concentration of not less than 5 lb./100 gal. The first application should be made just before emergence and the second *ca.* 3 weeks later. The treatment is practicable only for single ornamental trees, and not for stands affected by 'dieback'.

486. JACQUIOT, C. Sur le detérminisme de la formation des tumeurs ligneuses observées chez les chênes attaqués par *Agrilus biguttatus* Fab. (Coléopt. Buprestidae). [**The cause of woody tumours found on Oaks attacked by *A. biguttatus***]. *Repr.* from *C.R. Acad. Sci., Paris* 231, 1950 (1552–4). 1 ref. [F.f.] X.

Tumours found in association with the galleries of *A. biguttatus* when these extend into the cambium are caused by the larvae secreting a substance which has not been identified but which may belong to the same group as 2,4-D.

487. SMITH, C. C. **Elm leaf beetle, *Galerucella xanthomelaena* (Schr.).** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (1).

A severe outbreak occurred in Milltown, N.B., in 1949, and in May 1950 it was found that large numbers of the beetle had overwintered successfully in attics and other unheated buildings. A 10% DDT dust proved effective in killing such beetles. Spraying trees with DDT shortly after the buds burst, killed the adults and also larvae hatching from eggs already laid.

488. QADRI, M. A. H. **A preliminary study of the Poplar leaf beetle—*Nodostoma* sp.** *Pakistan J. For.* 1 (2), 1951 (119–21).

Life history, damage etc., of the most important pest of *Populus ciliata* and *P. nigra* on the Murree hills. [A corrected reprint gives *Phyllodecta abdominalis* as the name of the beetle.]

489. HALIBURTON, W. **On the habits of the Elm bark borer *Physocnemum brevilineum* (Say); (Coleoptera: Cerambycidae).** *Repr.* from *Canad. Ent.* 83 (2), 1951 (36–8). 4 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 2.)

The species described has been associated with Dutch Elm disease, but is apparently of no significance as a vector, and has little economic importance. It normally inhabits the outer bark of living Elms, and commonly injures living tissue. In felled trees the larvae feed in the inner bark and pupate in cells in the wood.

490. **Lead arsenate still best for White Pine weevil.** *Rep. Wis. agric. Exp. Sta. 1947–8, Part 2*, 1949 (79). (*Bull. Wis. agric. Exp. Sta.* No. 489).

Excellent control of *Pissodes strobi* was obtained by spraying plantations in April with a concentrated spray consisting of 9½ pints of water, 1 lb. lead arsenate, 4 oz. linseed oil, and 95 drops of Grasselli Wetter-spreader. The weevils apparently do not move rapidly from one area to another, and spraying also does not seem to drive them to neighbouring unsprayed trees.

491. CHARVÁT, K. Kôrovce, vyskytujúce sa na našich ihličnatych drevinách. [**Barkbeetles found on our conifers.**] *Pol'ana* 6 (7/8), [1950] (155–65). [Slovak.]

Separate lists of species are given for Spruce, Pine, Fir and Larch, under (*a*) stem (*b*) branches and twigs; also for species attacking roots of Pine, and Spruce/Larch.

492. KARPIŃSKI, J. J., and STRAWIŃSKI, K. Korniki ziem Polski. [**Polish barkbeetles.**] *Ann. Univ. M. Curie-Skłodowska, Lublin* (*Ser. C*) Suppl. V, 1948. pp. 239 + 28 sets of photos. 95 refs. [Pol.f.] L.S.

Discusses the morphology, anatomy, physiology, biological problems and the classification of barkbeetles; describes species found in Poland on softwoods, and on hardwoods, shrubs and herbaceous plants; lists species found in Poland and discusses their distribution; lists species with their host plants, and host plants with the species attacking them; lists the hymenopterous parasites of barkbeetles; and discusses the importance of barkbeetles in forestry, and methods of control. Indexes are given of the Polish names with their scientific equivalents.

493. NEVES, [C. M.] BAETA. Os pinhais do Estoril e as pragas. [**The Pine stands of the Estoril and their pests.**] *Gazeta das Aldeias, Porto* 54 (2170), 1949 (807–10). [Port.]

Notes on attack by barkbeetles and other pests.

494. THOMSON, M. G. **Engelmann Spruce beetle.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (1), 1951 (4).

A study of the build-up of *Dendroctonus engelmanni* populations in a mature Spruce stand showed that the process began with localized build-up of the indigenous beetle population in scattered windthrown trees, followed by a rapid increase in logging slash after the felling of 35% of the stand. In the ensuing years, nearly 20% of the residual stand was blown down, thus providing further breeding material for the beetles, which appear to prefer windthrown trees to logging slash, possibly because of the continuing partial sap flow.

495. PRELL, H. Kampf dem Borkenkäfer. Einführung in die Kenntnis von Lebensweise und Bekämpfung des Buchdruckers oder grossen Fichtenborkenkäfers (*Ips typographus* L.). [**Control of the barkbeetle. An introduction to the life history of *I. typographus* and control methods.**] Neumann Verlag, Radebeul and Berlin. 1949. pp. 49. [G.g.] Price *DM*1.80 [4*s.* 6*d.*]

496. KUHN, W. Das Massenauftreten des achtzähnigen Fichtenborkenkäfers *Ips typographus* L. nach Untersuchungen in schweizerischen Waldungen 1946 bis 1949. [**Studies of the epidemic of *Ips typographus* in Swiss woods 1946–9.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (245–350 + 6 photos). 39 refs. [G.g.f.]

After a general account of the life history of the insect, details are given of hibernation, swarming, and number of generations in Switzerland during the period 1946–9. It is held that the principal causes for the extent of the outbreak were (1) the presence of very large, pure Spruce stands outside the natural range of the species, and (2) the exceptionally long period of drought and high temperatures, which weakened many trees.

497. METELMANN, R. Versuche mit Hexa-Streichmitteln an Giftfangbäumen gegen die Fichten-Borkenkäfer. [**Experiments with BHC paints on trap trees for controlling *Ips typographus*.**] *Anz. Schädlingsk.* 24 (2), 1951 (17–9). 2 refs. [G.]

Reports field experiments in the use of insecticidal paints [cf. *For. Abstr.* 11 (No. 2284)]. The high toxicity of the preparations in comparison with dusts is offset by a 50% increase in time spent in preparing the trees and in costs. Dusting is therefore still the more economical method of preparing trap trees in spite of the lower toxicity and shorter duration of the effects of the dusts.

498. HIERHOLZER, O. Die Bedeutung der Sinnesphysiologie in der Schädlingsbekämpfung—erklärt an Untersuchungen über die Orientierung des grossen krummzähnigen Tannenborkenkäfers, *Ips curvidens* Germ. [**The significance of sense physiology in pest control—illustrated by the orientation of *Ips curvidens*.**] *Forstwiss. Cbl.* 70 (4), 1951 (228–34). 19 refs. [G.]

Observations and a discussion of the part played by scent and sight in directing the flight of *Ips curvidens*. Within short range of trees, both the scent and the sight of the tree are involved, whereas at long range sight is the more important factor. The choice of brood trees appears to be made by a process of trial and error. For example, in a mixed stand of Spruce and Fir, many beetles will alight on Spruce, as well as on Fir, the preferred species. The bearing of these facts on control measures is discussed.

499. KRAEMER, G. D. Zur Lebensweise von *Phloeosinus thujae* Perris. (Col. Ipidae), dem Wacholder- und *Thuja*- borkenkäfer. [**Habits of the Thuya and Juniper barkbeetle, *P. thujae*.**] *Forstwiss. Cbl.* 70 (4), 1951 (247–53). 9 refs. [G.g.]

Notes on the biology of the beetle, which spread to southern Germany during the drought years of 1947–8. The larvae and pupae have great resistance to drying-out of the wood in the host trees.

500. FERGUSON, J. H. A. *Xyleborus destruens* in de djati. [***X. destruens* in Teak.**] *Tectona* 39 (4), 1949 (387–9). [Du.e.]

Summarizes existing information on *X. destruens* damage to Teak, and concludes that this borer occurs mainly in wet climates at high altitudes, where Teak should not be planted.

501. [**Effect of brush burning on chafer larvae.**] *Rep. Wattle Res. S. Afr. 1950*, 1951 (29).

During experimental brush burning in Natal, the opportunity was taken to determine the effect of such operations on the larvae of chafer beetles in the soil.

The larvae found in sample pits were those of *Hippopholis sommeri* and *Anomala caffra*. Only a negligible number (3–5%) of larvae was killed by the heat, and then only when compact areas of 1 acre or more were burnt. The burning of the customary narrow brush piles had no harmful effect on the chafer population; the larvae dug in deeper and migrated from under the burning brushpile to the adjacent unburnt areas.

502. GROSCHKE, F. Weitere Beobachtungen und Gedanken zur Verwendung von chemischen Mitteln bei der Englerlingsbekämpfung in forstlichen Pflanzgärten und Kulturen. **[The use of chemicals in the control of *Melolontha melolontha* larvae in forest nurseries and plantations.]** *Anz. Schädlingsk.* 24 (4), 1951 (49–53). 4 refs. [G.]

Experiments with various preparations by the Institut für angewandte Zoologie, Munich, showed that soil treatment with 0·2% BHC emulsions at a rate of 10 litres/sq. m. is a quick and sure means of control. BHC powders give good results only under certain conditions. The emulsions, being more costly than the powders, are recommended only for urgent use in stocked nurseries or in already stocked hard ground. Application of the emulsions in furrows is recommended for fruit orchards and vineyards where the larvae lie deep in the soil. In forest nurseries, where they are near the surface, furrowing is less effective. BHC powders may be used on loose soils where speed of kill is less urgent or on unstocked ground. A rate of 1·2–1·5 kg./are is recommended. On unstocked ground the powders may be ploughed in; in stocked areas either the furrow or the hole method is used.

503. SCHWERDTFEGER, F. Weitere Untersuchungen zur Engerlingsbekämpfung mit Hexa-Mitteln. **[Further investigations into white-grub control with BHC preparations.]** *Mitt. biol. ZentAnst., Berl.* No. 70, 1951 (83–4). [G.] Also in *Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz* 57, 1950 (344–50).

Tests of pure BHC preparations.

504. GÜNTHART, E. Erfahrungen über die chemische Maikäfer- bzw. Engerlingsbekämpfung. **[Experiences in the chemical control of white grubs and/or cockchafers. [With discussion].]** *Mitt. biol. ZentAnst., Berl.* No. 70, 1951 (84–7). [G.]

Some results of work with BHC preparations.

Hymenoptera

See also Nos 50–1.

505. PETERSON, L. O. T. **Control of the yellow-headed Spruce sawfly [*Pikonema alaskensis*] in the agricultural areas of the Prairie Provinces.** *Procd. Publ. Div. Ent. Dep. Agric. Can.* No. 120, 1950. pp. 3.

Cf. *For. Abstr.* 11 (No. 3331).

Diptera

506. FONSECA, J. PINTO DA. A môsca da madeira *Pantophthalmus pictus* (Wied. 1821). **[*Pantophthalmus pictus.*]** *Biológico* 16 (10), 1950 (191–7). 7 refs. [Port.] C.G.B.

Describes the insect and the damage done by the larvae, which bore into living trees. Whitewashing during the period November–March affords satisfactory protection.

507. PAŠEK, V. Novy škodca na Slovensku: *Thecodiplosis brachyntera* Schwaegr. **[A new pest in Slovakia: *T. brachyntera.*]** *Pol'ana* 7 (2), 1951 (31–2 + 5 photos, 4 dgms.). 4 refs. [Slovak.]

An outbreak of this pest was notified in October, 1950, from the High Tatra (1,600–1,700 m. above sea level) as attacking the needles of *Pinus mugo* subsp. *pumilio*. The extent and degree of the outbreak are yet to be determined. This pest was previously recorded in Slovakia on *Pinus sylvestris*, affecting 50,000 ha. on sandy soil at low elevations in 1921–24, but this seems to be the first outbreak on *P. mugo*.

459. *Other Animals*

508. RAPPARD, F. W. De agaatslak (*Achatina fulica* Fer.), een gevaar voor jonge djaticulturen. **[The snail *Achatina fulica*, a danger to young Teak plantations.]** *Tectona* 40 (3/4), 1950 (365–6). [Du.]

A local infestation (Pendjaitan, Java) destroyed 90% of 1st-year nursery seedlings between December and April, both leading shoots and side leaves being eaten.

509. MATTHYSSE, J. G., and NAEGELE, J. A. **Mites on woody plants and their control.** *Proc. 26th nat. Shade Tree Conf.* 1950 (78–91). 12 refs.

510. SMITH, C. C. **Mites on trees.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 7 (2), 1951 (1).

Paratetranychus ununguis, a pest of ornamental conifers in New Brunswick and Nova Scotia, is much more numerous on trees that have been sprayed with DDT than on unsprayed trees. All stages of the mite can be killed by parathion. Nicotine sulphate at 1 quart/80 gal. plus 5 oz. of Triton-X-100 killed all stages except the egg; at least two applications, 10 days apart, are necessary.

46. DAMAGE TO TREE GROWTH BY MAN

511. HOOKER, L. W. **Logging damage: tree-length skidding vs. log-length skidding.** [Michigan College of Mining and Technology.] [*n.d.*] pp. 8.

Preliminary results of a study of the effect of arch skidding of tree-length logs, indicated that although this method injured more trees per skidding turn, ground skidding of shorter logs produced 42% more damage per 1,000 ft. of logs skidded. Tree-length skidding, however, produced more large scars. The % of residual stand damaged was 14·8 for tree-length and 20·63 for log-length skidding.

48. INJURIES DUE TO UNKNOWN OR COMPLEX CAUSES

512. CAMPBELL, W. A. **Fungi associated with the roots of littleleaf-diseased and healthy Shortleaf Pine.** *Phytopathology* 41 (5), 1951 (439–46). 10 refs.

A study was made of the fungi associated with mycorrhizal and fine roots of *Pinus echinata* suffering from littleleaf disease, and also of fungi associated with roots of healthy trees on littleleaf sites, and of healthy trees on littleleaf-free sites. The fungi isolated were divided into 11 groups. Most of them were types ordinarily considered non-pathogenic. *Phytophthora cinnamomi* was the only recognized

athogen isolated from *P. echinata* roots. It has een found widely distributed in the soil in littleleaf reas. [Cf. *For. Abstr.* 11 (No. 661).]

13. BUCHANAN, T. S., HARVEY, G. M., and VELCH, D. S. **Pole blight of Western White Pine: a umerical evaluation of the symptoms.** *Phytopathology* 41 (3), 1951 (199–208). 10 refs.

Observable characteristics considered to be eliable indicators of the severity of pole blight on *inus monticola* are: (1) Unexplained internal esinosis in the main bole. (2) Dead areas on the ain bole, or flattened areas not directly associated ith root crotches. (3) Length of last complete ear's internode on the leader. (4) Total length of eedle-bearing stem on the leader and upper crown anches. (5) Length and colour of needles in the pper crown. (6) Density of the upper crown. A umerical system based on these symptoms is resented, whereby the severity of the infection can e evaluated.

14. CONDON, R. W. **Mulga death in the West arling country.** *Journal of the Soil Conservation ervice of New South Wales, Sydney* 5 (1), 1949 (7–4). L.S.

Observations were made in a belt of Mulga *Acacia aneura*) scrub country, to ascertain causes f the widespread dying-out of this species. Drought, istletoe and attack by a scarab beetle (*Heteronyx* sp.) are possible contributory factors, but do not seem to be primary causes. The explanation may be that Mulga is not long-lived, and that the trees are dying of old age, while rabbits and sheep-grazing are preventing natural regeneration.

515. BAKSHI, B. K. **Mortality of *Casuarina equisetifolia* Forst.** *Indian For.* 77 (4), 1951 (269–76 + 9 photos). 6 refs.

Examination of plantations in Madras and Orissa indicated that die-back of Casuarina was due primarily to drought and nutrient deficiencies, and that trees thus weakened were sometimes attacked and killed by *Trichosporium vesiculosum*. Preventive measures include manuring of seedlings before transplanting, deep planting, and watering in the initial stages. Litter should not be removed from plantations. Pruning and lopping, which give opportunities for infection with *T. vesiculosum*, should be forbidden.

516. SCARAMUZZI, G. **Resinosi dell'olivo e possibile genesi della carie. [Gummosis of Olive and the possible origin of decay.]** *Olearia, Roma* 3 (7), 1949 (571–7). 7 refs. [It.] L.S.

Describes the phenomenon of gummosis in Olives and suggests a possible chain of events, including changes in the wood, leading from gummosis to decay.

. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

52. MEASUREMENTS OF STEM DIMENSIONS AND VOLUME OF TREES, STANDS, FORESTS AND TIMBER

521. *Diameter (Girth) and Sectional Area*

See also No. 526.

17. ŠUŠTERŠIČ, M.. Taksatorska premerka. **The valuer's caliper.]** *Gozd. Vestn.* 7 (10), 1948 251–4). [Sloven.]

The caliper has graduations on both sides and a etachable handle 1·3 m. long fitting into a hole at he centre of gravity of the caliper. There is no novable arm. The diameter is read where a line aken by eye tangentially from the tree cuts the raduations. Measurements are accurate to 1 cm. The caliper, which is made of Spruce, is so light that t needs only one hand, and is quick in use (illustrated) and cheap. It has been used successfully in lovenia for a year.

18. SOEST, J. VAN. Principiële vraagstukken bij roefperken. 2. Diktemetingen. [The main problems in sample plots. 2. Diameter measurement.] *Ned. Boschb.-Tijdschr.* 23 (6), 1951 (161–8). 4 refs. Du.g.]

[Cf. *For. Abstr.* 12 (No. 2482).] A series of experiments was made to determine the accuracy of different methods of calculating diameter. Results showing the differences in basal area obtained by the different methods are tabulated. Averages of 2 diameters, taken at right angles, measured in mm. were taken to the nearest ½ mm. and the nearest mm. below, and were successively rounded to cm. classes with the mid-point of the classes (*a*) at each whole cm., and (*b*) at each ½ cm. mark. Single diameter measurements were made in cm. classes with the mid-point at the whole cm. and the ½-cm. mark, in 2-cm. classes with the mid-point at the even cm., and in 4-cm. classes with the mid-point at 5, 9, 13 cm., etc. The measurements were carried out on sample plots of Douglas Fir, Corsican Pine, Austrian Pine, and Japanese Larch, ranging in age from 10 to 81 years. They showed that: (1) there was very little variation between the results of different methods of calculating from 2 diameters; (2) the results from measuring single diameters varied very little from those from 2 diameters; and (3) measurements by 2- and 4-cm. classes only differed seriously from those by 1-cm. classes in the case of very small trees (10-year-old Japanese Larch, 2–7 cm. in diameter). As a result of these experiments, measurement of a single diameter in cm., with the mid-point at the ½-cm. mark, is recommended.

522. *Height, Length*

519. STOFFELS, A. **De nauwkeurigheid van metingen met een gewijzigde hoogtemeter van Vorkampff-Laue. [The accuracy of measurements with a modified Vorkampff-Laue hypsometer.]** *Ned. Boschb.-Tijdschr.* 23 (3), 1951 (68–74). 7 refs. [Du.f.]

Measurements with the Vorkampff-Laue hypsometer (ordinary 30-cm. model with notch 3 cm. from bottom for sighting the point at $\frac{1}{10}$ of tree height) were found to be considerably less accurate than those made with a Christen hypsometer; the mean error is considerable for small trees. Errors can be reduced by adding notches at 5, 6, 7½ and 10 cm. from the bottom (i.e. giving sightings of $\frac{1}{6}$, $\frac{1}{5}$, $\frac{1}{4}$, and $\frac{1}{3}$ of tree height), using the lower notches for measuring taller and the upper for shorter trees.

524. *Determination of the Volume of Trees and Stands*

524.1. Principles of Volume Determination. Form (Taper)

520. EDGREN, V., and NYLINDER, P. Funktioner och tabeller för bestämning av avsmalning och formkvot under bark för tall och gran i norra och södra Sverige. **[Functions and tables for determining taper and form quotient under bark for Scots Pine and Norway Spruce in N. and S. Sweden.]** *Medd. SkogsforsknInst., Stockh.* 38 (7), 1949. pp. 81. 12 refs. [Sw.e.]

The material for this study consisted of the extensive sample-tree data used by Näslund for his volume formulae and tables [see *For. Abstr.* 9 (No. 618)]. The somewhat S-shaped under-bark stem profile of both species is found to be described entirely satisfactorily by 3 logarithmic functions covering respectively the top 40% of the stem length, the portion from there to the start of the butt swelling, and the butt. The form quotient used is diameter at 60% divided by diam. at 20% of tree height. The constants of the functions are tabulated, their values being converted so that, knowing the form quotient, the diam. at any desired % of tree height is obtained in % of diam. at ground level. Hitherto unpublished functions computed by Petterson from Näslund's material are also included; these give the form quotient u.b. from height, d.b.h. u.b., and form factor u.b. The volume from stump height to any given % of tree height is also determined, using Näslund's data. For each species and region the authors construct:—(1) u.b. taper tables for form quotients 0·500 to 0·800, showing, against any % height in the stem, the corresponding diam. (in % of diam. at ground level) and the volume (in % of total stem volume) between stump height (taken as 1% of tree height) and that diam.; (2) tables giving u.b. form quotient from height and d.b.h. u.b. A special supplement deals with the practical use of the tables (in conjunction with Näslund's volume tables) for computing possible outturn by assortments, and auxiliary tables are appended which give b.h. in % of tree height, and log length in feet or dm. in % of tree length. Captions of graphs and most of the tables are translated into English.

524.3. Volume of Tree Groups and Stands

521. HUMMEL, F. C., IRVINE, T. W., and JEFFERS, J. **General volume tables for Norway Spruce in Great Britain.** *For. Rec. For. Comm., Lond.* No. 10, 1950. pp. 24. Price 1*s.*

522. BENASSI, L. Criteri di scelta degli alberi modello. **[Criteria for the selection of sample trees [for volume estimation].]** *Ital. for. mont.* 6 (2), 1951 (90). [It.]

523. HEISKANEN, V. Mäntytukkipuiden kuutioarvioinnin tarkkuudesta. **[The accuracy in [ocular] appraisal of the volume of Pine timber trees.]** *Commun. Inst. for. Fenn.* 38 (6), 1950. pp. 24. 29 refs. [Fi.e.]

A study was made of the accuracy of ocular estimations by 146 men in 3 marked stands. More than 80% of the volume estimates were too low. The same general tendency was observed, though in a slighter degree, in estimation of usable length and of number of logs in tall trees. Estimates of number of logs in short trees, however, tended to be too high.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

524. TIDEMAN, P. **Outlines of the methods of forest survey as applied on the Islands outside Java.** *Tectona* 40 (2), 1950 (119–26). [E.]

525. BOON, D. A. De betrouwbaarheid van de proefbaanopnamen in het ijzerhoutgebied van zuidoost Borneo. **[The reliability of sample strips in the Ironwood region of southeast Borneo.]** *Tectona* 39 (4), 1949 (334–47). [Du.e.]

A strip enumeration (20-m. strips 1 km. apart) was made of Ironwood (*Eusideroxylon zwageri*) in 6,400 ha. of mixed rain forest where this species formed *ca.* 30% of total timber volume, the remainder being largely mixed dipterocarps. The reliability of the results was tested from sample plots, and a table constructed to show, for a given area of the whole area sampled and a given % measured, the probable error of the average timber volume.

526. LØVENGREEN, J. A. Taksationsspejl til afsætning af cirkulære prøveflader samt grundfladetælling afprøvet af Statens forstlige Forsøgsvæsen. **[Mirror instrument for setting out circular sample plots and basal-area enumeration tested by the State Forest Research Branch.]** *Dansk Skovforen. Tidsskr.* 35 (10), 1950 (509–27). [Dan.]

Describes and illustrates an improved version of the author's mirror instrument [see *For. Abstr.* 9 (No. 622)] incorporating means for taking *Winkelzahl* readings [cf. *For. Abstr.* 12 (No. 2483)]. Once set, the instrument works with fixed angles. It has a fixed mirror which transmits to the observer's eye the reflections from 3 adjustable mirrors. Of these, the middle one is set parallel to the fixed mirror, thus giving a bearing at the observer's eye which is parallel to the bearing from the middle mirror to a given object. This provides a reference image with which the other images must coincide when checking either the radius of a sample plot or the *Winkelzahl* of a tree. The left-hand adjustable mirror is set at an angle such that two marks one above the other on a centre stake appear to coincide when viewed through the instrument at a distance equalling 5 times the distance between the marks. As with the

earlier version of the instrument, radius of plot can then be varied by adjusting the distance between the marks on the stake. The third adjustable mirror is set to give coincidence of images for a tree diameter/distance ratio of 1/50, i.e. a *Winkelzahl* of 2. The theory of the instrument is set forth, with corrections for distance of stake from observer (since bearings from the eye to the top and bottom marks on the stake are not equiangular) on level and sloping ground, and (since the instrument lacks the compensating device of the Relascope) for *Winkelzahl* readings on sloping ground. Results of tests in sighting to a centre stake show that the mean error for a practised observer is likely to be 0·15–0·33% (depending on the light) of actual plot radius. Systematic personal errors can be minimized by adjusting the appropriate mirror under controlled conditions. *Winkelzahl* estimates were at first poor, but personal errors and lack of practice were clearly responsible in part. In a second test in young Spruce, 3 observers were allowed to practise a little before taking readings, and in this case the mean of the *Winkelzahl* b.a. estimates for all observers, each of whom made 4 separate measurements, was 28·8 sq. m./ha. compared with 28·7 as estimated from 4 measurements of circular sample plots. Bitterlich's original sighting rod, tested by the same observers under the same conditions, was somewhat less accurate, giving a b.a. of 28 sq. m./ha. The average times per complete sweep by Bitterlich's method were 1 min. 48 sec. for the mirror instrument and 1 min. 46 sec. for the simple sighti ng rod

526. *Log Measurement. Scaling*

527. LAVER, C. F. **Principles of log measurement.** Ernest Benn Ltd., London. 1951. pp. 200. Price 10*s*. 6*d*.

The principal theme of this book is the examination of the conventional methods of log measurement against a mathematical background, in order to determine their relationship with true measure. Examples are worked both in decimals and in duodecimals. The following chapters are included:—log measures; log measurement; rectangular log measure; round log measure; unequal-diameter log measure; waney log measure; miscellaneous log measures; logs having regular taper; logs having irregular taper; fall-offs and stops; bark allowance; abatement for defects; conversion losses.

528 EKLUND, B. Relationstal för transformering av topmätt volym sågtimmer av tall och gran till verklig kubikmassa. **[Factors for converting volume as determined by top measurement to true solid volume, for sawlogs of Scots Pine and Norway Spruce.]** *Medd. SkogsforsknInst., Stockh.* 38 (2), 1949. pp. 40. 3 refs. [Sw.sw.e.]

The customary method of scaling sawlogs in Sweden is by top diameter and length, measured in inches and feet respectively, and the nominal volume is that of a cylinder with a sectional area corresponding to the top diameter. The relation of this volume to true volume can be expressed by a 'top form factor', and from data on 941 Pine and 778 Spruce logs from a large number of felling sites in central Sweden, the author calculates mean top form factors—without distinction of species—for finding true volume o.b. and u.b. for various top-diameter and length classes. These factors are intended for use with ordinary runs of logs, where a high degree of accuracy is not essential. For cases demanding greater accuracy, the data were analysed statistically to obtain two functions, values for which are tabulated for practical use. The first table gives, from top diameter, length and taper (mm./m.), a 'basic top form factor' which is independent of species or type of log. The second enables this 'basic top form factor' to be converted to the true top form factor according to species and type of log (butt logs, middle and top logs, all logs). In all cases the length and diameter values used in the tables are nominal ones including customary trimming allowances etc. Bark factors and taper are analysed in special chapters.

53. SPECIAL MEASUREMENTS OF TREES AND STANDS (CROWN DIMENSIONS, STAND DENSITY ETC.)

See also Nos. 148, 157, 284, 552.

529. KAWADA, M., and KIJIMA, T. **Study of crown-spread in relation to the diameter of individual trees in an even-aged [coniferous] stand.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 41, 1949 (1–27). [Jap.e.]

Tabulated figures are given showing the crown spread and diameter of *Pinus densiflora* (898 trees measured in 1943), and of *Cryptomeria japonica* (1,194 trees measured in 1929, 785 trees measured in 1941, and 591 trees measured in 1946). A formula, not considered as satisfactory in all cases, is presented for calculating crown spread. *From authors' summary.*

530. LESCAFFETTE, J. Une propriété des arbres et des peuplements—la surface génératrice. **[A property of trees and of stands—the 'generating surface'.]** *Bull. Soc. for. Franche-Comté* 25 (17), 1951 (712–25). [F.]

The 'generating surface' is a conventional measure of the cambial surface of a tree, which can be used instead of volume/ha. or basal area to represent stand density. The author claims that it is a better measure of possibility than either of those criteria, e.g. a selection forest and a pole stand of Fir have about the same volume/ha., but the generating surface and yield of the latter are twice as great as those of the former. A table of generating surface corresponding to normal volume tables is constructed from the formula $sg = dv/dr$, where sg = generating surface, dr = annual radial increment at breast height, and dv = annual volume increment. The possible use of this conception in the study of forest stands and their development is discussed. [Cf. Lexen, *For. Abstr.* 5 (p. 287).]

54. ASSESSMENT OF SITE QUALITY

See also Nos. 93, 538, 562.

531. TAMM, O. **Principles of classification of forest sites in Sweden by examination of the soil.** *Trans. 4th int. Congr. Soil Sci. 1950* 1, [1951?] (364–7). 9 refs.

Classification of northern forest sites may be accomplished by mechanical and mineral tests of the subsoil, along with careful observation of the soil profile and analyses of the A_1 horizon. The soil tests common in agriculture should only be used with reservations. [Cf. *For. Abstr.* 8 (No. 1497).]

532. Carbonnier, C. Ett bidrag till kännedom om ekens produktionsvilkor. **[Research on conditions affecting Oak yield.]** *Svenska SkogsvFören. Tidskr.* 47 (5), 1949 (253–74). 14 refs. [Sw.sw.]

A small-scale investigation was made on 9 sample plots in different parts of southern Sweden to determine the effect of soil and climate on Oak. Details are given of position, site, aspect and vegetation for each plot; figures showing stand quality, soil characteristics, and average temperature and precipitation are tabulated; and the relationships between the quality class and the other factors are shown in graphs. The following conclusions are drawn:—(1) An investigation of the soil profiles (all the soils were found to be brown-earth types, and only one showed signs of slight podzolization) and of the vegetation, showed no nutrient differences sufficient to account for the considerable differences in stand quality. (2) No clear relationship was found between climate and stand quality. (3) The presence of ground water within easy reach of the roots is an important contributory factor to high production. (4) Although the relationship is not clear, there appears to be a tendency for the stand quality to decrease with decreasing content of fine earth and clay. (5) The base mineral index (the % of mineral with specific gravity over 2·680 in the medium sand fraction) and the clay base index (calculated from the clay content and the base mineral index) are both directly related to stand quality. No conclusion could be drawn as to the effect of phosphoric acid, partly because it is generally present in the form of apatite which also contains Ca in a fairly soluble form.

533. **Rehabilitation of forest soils [: litter and site index of Loblolly Pine].** *Rep. Sth. For. Exp. Sta. 1950* [1951] (22–3).

A study in northern Mississippi indicated that litter under Loblolly Pine may weigh 6 tons per acre more than that under Eastern Red Cedar, but that the proportion of Ca and of excess base is higher in the latter. Herbaceous cover appeared to be inferior to either species in soil-building characteristics. An empirical investigation of soil/site relationships on the Bankhead National Forest in Alabama has led to a scheme of site valuation in which the Loblolly site index is estimated at 77 + topographic score + aspect score + gradient/soil score. The last-named is read from a table, topographic score is 0 for flat or broad ridge tops, + 4 for bottoms or lower slopes, and – 2 for upper or middle slopes and narrow ridge tops, while aspect score is 0 for exposure within 22½° of due west or east, + 8 for more northerly aspects and – 3 for more southerly aspects. [Cf. *For. Abstr.* 12 (No. 2623).]

534. Etter, H. Über die Ertragsfähigkeit verschiedener Standsortstypen. **[The productivity of different site types.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (91–152). 55 refs. [G.g.f.]

The author has attempted to find a method by which indices of volume production may be rapidly assigned to natural site types. Detailed examination of the literature and of sample-plot data leads him to conclude that height of the dominant storey (*Oberhöhe*) is the best criterion for evaluating the total yield of a forest. In the broadleaved forests of the Swiss plateau, for example, this criterion enabled total yield to be estimated within limits of ± 10%. (It should be noted that there were only 3 examples of Oak woods in the material examined, so the results cannot be taken as certain for Oak.) The correlation between height of dominants and total yield in high forest is independent of the method and degree of thinning and also of site fertility. Beech woods and mixed stands of Ash, Beech and Sycamore Maple of the same height, yield the same volume of wood. Fir and Spruce stands have a rather higher yield than broadleaved stands of the same height.

535. Ure, J. **The natural vegetation of the Kaingaroa plains as an indicator of site quality for exotic conifers.** *N.Z. J. For.* 6 (2), 1950 (112–23). 3 refs.

Ecological descriptions of 3 sites for *Pinus radiata* have been prepared by correlating mean top-height measurements with the floristic composition of natural vegetation of the Kaingaroa Plains. Two sites for *Pseudotsuga taxifolia* and *Pinus nigra* var. *calabrica* are also defined, and the most suitable sites for 7 other exotic conifers indicated. *From author's summary.*

536. Matuszkiewicz, W. Przyczynek do ekologii buka. **[A contribution to the ecology of Beech.]** *Ann. Univ. M. Curie-Sktodowska, Lublin (Ser. C)* 3 (2), 1948 (39–42). [Pol.e.] L.S.

A study of diameter distribution of Beech of the Pilosetum and Muscosum types (100 stems each), growing *ca.* 100 m. apart on different soils (analyses tabulated), indicated that the superior growth in the Pilosetum was due to better edaphic conditions.

56. INCREMENT, DEVELOPMENT AND STRUCTURE OF STANDS

See also Nos. 200 *et seq.*, 303 *et seq.*

537. Wiedemann, E. Ertragskundliche und waldbauliche Grundlagen der Forstwirtschaft. Teil I. Das Wachstum des Einzelstammes und des gleichaltrigen Reinbestandes unter dem Einfluss von Standort und Bestandespflege. **[Silvicultural and growth studies as bases of forestry. Part I. The growth of individual trees and of even-aged stands as affected by site and tending.]** J. D. Sauerländer's Verlag, Frankfurt a.M. 1950. pp. 1–128. [G.] Price [11*s.* 6*d.*]

538. Wiedemann, E. Ertragskundliche und waldbauliche Grundlagen der Forstwirtschaft. Teil III. Die Ermittlung der Standortsgute. Die Veränderungen des Standortes. Waldbauliche und wirtschaftliche Folgerungen. **[Silvicultural and growth studies as bases of forestry. Part III. The**

determination of site class. Site changes. Conclusions relating to silviculture and management.] J. D. Sauerländer's Verlag, Frankfurt a.M. 1951. pp. 235–346. 83 refs. [G.] Price [10*s*.]

561. *Increment in Height, Diameter, Basal Area, Form and Quality; Variations and Trends; Dendrochronology*

See also Nos. 148, 155–9.

539. SCHOBER, R. Zum Einfluss der letzten Dürrejahre auf den Dickenzuwachs. **[The influence of recent drought years on diameter increment.]** *Forstwiss. Cbl.* 70 (4), 1951 (204–28). 12 refs. [G.g.] [Institut für Forsteinrichtung und Ertragskunde der Forstlichen Fakultät der Universität Göttingen.]

Measurements of increment in a number of hardwood and coniferous species were taken over the period 1947–9, and compared with values for 1946, a year of normal rainfall, at (*a*) about 300 and (*b*) 500 m. above sea level. In the dry year of 1947 diameter increment in all species except Beech growing at (*b*) showed a decrease by the standard of 1946. Except in *Larix decidua* the decrease was more marked at (*a*) than at (*b*). In the normal year 1948, the effect of the dry year was still evident at (*b*), where values were again sub-normal. At (*a*) however, a slight increase over the normal was observed. In 1949, another dry year, most species at (*a*) did not maintain this rate, whereas at (*b*), increment remained the same or improved slightly over 1948. The reaction to drought at the lower altitude, therefore, is much more immediate and marked than at the higher. When diameter increment values for 1947–9 were compared with those for 1946, the species most affected was *L. leptolepis*. Next in susceptibility were *Pseudotsuga taxifolia*, *L. decidua*, *Quercus borealis* and *Picea abies*. *Pinus sylvestris*, *Fagus sylvatica* and *Quercus robur* s.l. suffered relatively less. Decrease in basal-area values was about 3–10% less than the decrease in diameter increment. Decreases in diameter increment varied in the individual stem, the greatest decrease being found at a height of about 20–40% of the height of the tree. Measurements of d.b.h. therefore cannot be taken as representative of the tree as a whole.

540. MIKOLA, P. Katovuodet ja metsien kasvu. **[Tree growth in years of crop failure.]** *Metsät. Aikak.* 1950 (6), (204–5). [Fi.e.]

From data collected from 300 Scots Pine and 180 Spruce in central Finland, the author presents graphs showing the average annual radial growth of each species from the year 1700 to 1944. Comparison with known years of agricultural crop failure reveals a correlation between this and reduced tree growth wherever crop failure was due to excessive moisture or frost (resulting in a cooler summer) but not where drought caused failure. In 18 years of crop failure recorded since 1800, radial growth of Pine and Spruce has averaged 18% less than the growth in the preceding year.

541. MIKOLA, P. Puiden kasvun vaihteluista ja niiden merkityksestä kasvututkimuksissa. **[On variations in tree growth and their significance to growth studies.]** *Commun. Inst. for. Fenn.* 38 (5), 1950. pp. 131. 89 refs. [Fi.e.]

The material for this study consisted mainly of increment cores from undisturbed natural stands in different parts of Finland, together with stem analysis of a limited number of trees from sample plots.

Increment curves illustrating normal radial growth show that the maximum width of annual ring occurs earlier on a good than on a poor site, in North than in South Finland, and in Pine than in Spruce. Once the radial growth has passed its maximum, each successive annual ring is slightly narrower, provided there are no climatic variations in growth. Variations in annual ring index (= ratio between annual-ring width of a certain year and normal ring width, expressed as a %) depending on climate are slight in Finland, though somewhat greater in the North than in the South; annual variations are greater in Spruce than in Pine, but more distinct long-term variations occur in Pine. Variations in height growth are of roughly the same range as those in radial growth. The radial growth of Spruce is affected relatively more strongly by the temperature of early summer, of Pine by that of mid and late summer. The decisive importance of July temperature to radial growth increases towards the North. No correlation was found between annual growth of trees and depth of soil freezing, date of thaw, or amount of precipitation.

Annual variations in growth are similar in sparse and dense stands but long-term variations are greater in the latter. Both annual and long-term variations are greater in dominated than in dominant storeys. Variations in radial growth are relatively somewhat greater in old than in young trees. Flowering and seed production also affect growth; the growth of Spruce, in particular, in which variations in cone crop are great, is remarkably small in years of abundant cone production [cf. *For. Abstr.* 13 (No. 148)]. Evidence for the previously reported cycles of 11, 17, 23, and 35 years were discernible in Pine growth in all the material studied; no evidence for an 11-year cycle was found in Spruce. The cycles are entered on somewhat later in North than in South Finland and long cycles (23 and 35 years) are more marked in the North.

The practical significance of growth variations is discussed. The data are set out in 41 graphs and 55 tables.

542. ZINKIEWICZ, W. Badania nad wartością przyrostu rocnegu drzew dla studiów nad wahaniami klimatycznymi. **[Research on the value of the annual increment of trees for studies of climatic fluctuations.]** *Ann. Univ. M. Curie-Skłodowska, Lublin* (*Ser. B*) 1 (1), 1946 (177–234). 36 refs. [Pol.e.] L.S.

A study of variations in the width of growth rings of *Pinus sylvestris* and of variations in rainfall for the period 1872–1944 showed no distinct correlation for individual trees, but good correlation for the averaged annual variations for 9 trees from the same site, of about the same age and height and solely dependant on rain for their moisture. Fluctuations

in the annual rainfall were reflected in the following year's growth. Results are graphed ('lignograms').

543. PATRONE, G. Calcolo dell'incremento percentuale di volume della fustaia da dirado. **[The calculation of increment % of selection forest.]** *Ital. for. mont.* 6 (1), 1951 (40–1). [It.]

Develops and explains the application of the formula $p = \frac{2{,}000}{nd}$ where p is the increment % of a normal selection forest for a rotation of 100 years, n is the mean time taken by the trees to pass from one [? 4-cm.] diameter class to the next, and d is the exploitable diameter in cm.

544. PETRINI, S. Räkneproblem med tillväxtprocenter vid avverkningsberäkning. **[Computational problems with increment %s in the calculation of fellings.]** *Svenska SkogsvFören. Tidskr.* 47 (1), 1949 (33–8). 1 ref. [Sw.]

In extension of a previous paper, it is shown that the formulae for discount and future value with simple interest are unsuitable for calculating fellings (e.g. thinnings) in young stands, since they assume the absolute annual increment to be a constant amount irrespective of the times at which thinnings are made. For old stands in which the increment curve has flattened out they can be used, but not for periods in which considerable (e.g. principal) fellings are made. The formula for future value, however, can be modified to meet this case by adding a term to account for increment 'lost' by the felling of trees that would otherwise have grown on, viz.

$$\frac{a}{1 + \frac{n_1 p}{100}} \times \frac{n_2 p}{100}$$

where a is the volume felled after n_1 years, and n_2 is the remaining number of years in the period n. The complete equation than reads:

$$m_n = m_o \left(1 + \frac{np}{100}\right) - a - \left(\frac{a}{1 + \frac{n_1 p}{100}} \times \frac{n_2 p}{100}\right)$$

[remainder of notation the same as in the previous paper; see *For. Abstr.* 7 (No. 2103).]

562. *Volume Increment*

545. FINCH, T. L. **How fast is timber growing in eastern Montana?** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 88, 1951. pp. 7.

Growth data for 1946–9 show that, in spite of poor soil, a short growing season and low precipitation, the growth rate in unmanaged stands is better than had been supposed. Figures for bd. ft. and cu. ft. growth per unit of sawtimber and of primary growing stock respectively, and for the growth % of major species (Ponderosa and Lodgepole Pine, Douglas Fir, Engelmann Spruce and Cottonwood) are tabulated.

546. HEIBERG, H. H. H. Utforskningen av ekstensive driftsformer i skogbruket. **[Research on extensive systems of management in forestry.]** *Svenska SkogsvFören. Tidskr.* 47 (3), 1949 (175–80). 9 refs. [Nor.e.]

Most of the information so far available from Europe for rate of growth and yield is applicable only to forests under intensive management. The need for research on stands where removal of the larger trees creates large openings in the canopy is stressed.

547. BOURGENOT, L. Production et accroissement. **[Yield and increment.]** *Rev. for. franç.* 1951 (3), (166–79). 8 refs. [F.]

Discusses several formulae for calculating total yield, increment, and recruitment to enumeration size, in selection forest, with particular emphasis on the importance of this recruitment in calculating total yield.

548. CHATELAIN, F. Passage à la futaie et production dans les futaies jardinées. **[Recruitment [to enumeration size] and [total] yield in selection forest.]** *Rev. for. franç.* 1951 (3), (180–93). [F.]

Describes and illustrates a method of calculating recruitment and increment in selection forest.

566. *Yield Tables and Their Construction*

549. PATRONE, G. Ricerche dendrometriche sui cedui della macchia mediterranea della Maremma toscana. **[Mensurational studies of Mediterranean maquis coppice in the Tuscan Maremma.]** *Ital. for. mont.* 6 (2), 1951 (79–88). [It.it.f.]

Constructs yield tables (using Baur's formula) for (*a*) firewood alone and (*b*) firewood + faggots, on 3 site qualities, and gives data on volume distribution of the principal species.

568. *Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.*

See also Nos. 284, 304.

550. NYYSSÖNEN, A. Vertailevia havaintoja hoiddetujen ja luonnentilaisten männiköiden rakenteesta ja kenityksesta. **[Comparative observations on the structure and development of tended and natural Pine stands.]** *Silva Fenn.* No. 68, 1950. pp. 48. 29 refs. [Fi.e.]

A detailed analysis, with graphs and tables, of 3 pairs of sample plots of even-aged, almost pure *Pinus sylvestris*, contrasting a thinned and unthinned (natural) plot in Cajander's OMT, VT and CT. The observations, covering 17, 21 and 22 years respectively, are concerned chiefly with the proportional distribution in the canopy of the various tree classes under each set of conditions and their average diameters and increments at each thinning.

551. SALWÉN, N. Studier över massatillväxtens fördelning å dimensions- och sortimentsklasser i normalskogar av tall med 80-, 100- och 120-åriga omloppstider. **[Studies on the distribution of volume increment by diameter and assortment classes in normal forests of Pine with 80-, 100- and 120-year rotations.]** *Svenska SkogsvFören. Tidskr.* 47 (2), 1949 (115–33). [Sw.sw.]

All the sample-tree data from the first Forest Survey of Södermanland for Scots Pine up to 120 years old (2,060 trees) are used to construct 3 imaginary normal forests, each of 100 ha., on rotations of 80, 100 and 120 years. The absolute and % distribution of volume u.b. is tabulated for each normal forest against diameter (5-cm. classes) and age (20-year classes). Calculations are made of the net

increment u.b. (deducting recruitment into and out of each class) distributed by 2·5-cm. diam. classes, and of the distribution of this increment by assortment classes (small wood, pulpwood, timber) within each diameter class. Results are tabulated for each normal forest, together with a table of bark data for conversion to o.b. figures.

552. Badoux, E. L'allure de l'accroissement dans la forêt jardinée. **[The trend of increment in selection forest.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (9–58). 71 refs. [F.f.g.]

Analyses data from 4 mixed Fir/Beech stands and 2 pure Spruce stands, in order to determine the curves of rate of height, diameter, and volume growth respectively, the relations between increment and position in the stand of a given tree, and between increment and the weight of foliage. (1) It was found that trees of 20–30 cm. in diameter generally show the most rapid height growth, though the maximum may occur earlier, particularly in Beech. (2) The age at which maximum rate of diameter growth is attained, varies much more with site. The rate of diameter growth is much less in pure Spruce than in mixed Fir/Beech stands; that of Beech is superior to that of Spruce in the early stages, but is overtaken later. (3) The curves of stem volume increment strongly resemble those of diameter increment, but culminate much higher in the scale of diameters, so that a tree whose diameter increment is slowing down may continue for a long time to increase its annual production of stemwood. (4) The total cover ha. for trees of 8 cm. diameter and over, was 12,000 sq. m. for the mixed Fir, and 5,000–6,500 sq. m. for the pure Spruce stands. In a good Fir stand the largest trees may cover as much as 1 are of ground. The crown of the Spruce is markedly narrower than that of the Fir in the small- and medium-diameter classes, but later equals or even excels it. The crown of a Beech occupies at least twice the area of a conifer of the same diameter, and the yield/unit cover is 3 or 4 times greater for the conifers than for Beech. In general it is trees of 30–50 cm. diameter that profit most from the space occupied by their branches. (5) As a rule, and for equal diameters, the weight of needles of a Spruce is less than that of a Fir, and the weight of foliage of a Beech is ½ to ¼ that of a conifer. The maximum production of wood/weight of foliage is usually attained by trees 20–40 cm. in diameter.

569. *Miscellaneous*

553. Hirai, S. **Studies on the weight-growth of forest trees (II). *Picea excelsa* Link of the 'Chichibu' University forest.** *Bull. Tokyo Univ. For.* No. 38, 1950 (139–52). 8 refs. [Jap.e.]

Four sample trees, 30 years of age, were examined for distribution of bulk density within the stem, and from this the weight increments of individuals and of the stand were calculated. The following results were obtained: (1) Relation between stem class and weight is rather uncertain; suppressed trees generally have heavier wood, but dominants do not necessarily have the lightest wood. (2) The wood is heavy at the middle of the base of the tree and becomes lighter upwards and outwards; the lightest wood is formed at 15–25 years. (3) Some correlation exists between ring width and bulk density. (4) The weight and volume increments of individual trees are almost parallel. (5) Standard bulk densities for the individual trees, obtained by dividing the total weight increment by total volume increment are 304–345 kg./cu.m. with an average of 328 kg./cu.m. (6) Total yield per ha. for this stand is 73,003 kg. and 223·24 cu.m. with m.a.i. of 2,433 kg. and 7·44 cu.m. *From author's summary.* [(Cf. *For. Abstr.* 13 (No. 630).]

58. SURVEYING AND MAPPING (INCLUDING AERIAL SURVEYS)

581/584. *Ground Surveys*

583. Application of Maps to Special Purposes

554. Hide, R. H. **The problem of slope.** *Quart. J. For.* 45 (2), 1951 (89–94).

Discusses the relationship between the distances and acreages on a map with the actual distances and acreages on sloping ground, and gives some practical examples where it may be useful to know the magnitude of the differences involved, e.g. for planting distances on steep slopes.

585/588. *Aerial Reconnaissance and Survey*

555. Kools, J. F. Luchtfoto-interpretatie ten behoeve van de bosexploratie en de bosinventarisatie in Indonesie. **[The interpretation of aerial photographs in forest surveys and inventories in Indonesia.]** [pp. 7] in *Ontdekkingsreizen in de Luchtfoto, Nederl. Vereniging voor Fotogrammetrie*, 1949. [Du.e.]

The following conclusions have been drawn from work carried out between 1947 and 1949:—(1) It is possible from air photographs to classify land into cultivated areas, young secondary forest, old secondary forest, devastated woodland, Mangrove forest, and swamp vegetation, and into 5 density grades of dryland forest. (2) Such classification takes one man 6 weeks for 20,000 ha. from photographs on a scale of 1 : 20,000. (3) Tentative efforts to determine tree species from photographs were disappointing. (4) Maps produced from photographs are extremely useful in planning land surveys. (5) Further investigations on the relation between air photographs and vegetation, and on the best scale, filter and emulsion are desirable. *From author's summary.*

556. Cosma, D. Fattori che influenzano il costo dei rilievi aerofotogrammetrici a carattere forestale. **[Factors that affect the cost of aerial-photographic forest surveys.]** *Monti e Boschi* 2 (3) 1951 (117–22). [It.]

Discusses such factors as scale of photos, size and shape of area to be covered, and particularly topography.

557. Johnson, W. L. **Comparative accuracy and cost of topographic mapping by ground and air survey methods.** *B.C. Lumberm.* 35 (5), 1951 (47–50, 114, 116, 118, 120). 6 refs.

A test area of *ca.* one sq. mile was mapped by

standard ground and air survey methods. No practical difference was found between the accuracy of contour position on the 20% topographic ground survey and that of contour position obtained by double-projection air-survey methods. Comparative costs for the test area of 600 acres were 60 cents/acre for air and $1.62/acre for ground survey. For areas of 4,000 acres and over the costs are estimated at 30–35 cents and $1.60 respectively. Time required to map the test area was 11 man-days by air and 90 by ground survey. Questions relating to topographic detail, tally points, and the mapping of boundaries, require further study.

558. West-Nielsen, G. Kortlægning fra luften. **[Mapping from the air.]** *Dansk Skovforen. Tidsskr.* 35 (5), 1950 (271–80). [Dan.]

Gives details of the preparation of mosaics from aerial photographs of 3 Danish plantation areas, with notes on accuracy and costs.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. FOREST MANAGEMENT: GENERAL, THEORY AND PRINCIPLES

See also Nos. 176, 182, 538, 551, 865.

559. Marshall, C. **Sustained yield management of the Mangrove salt water swamp forest of Fiji.** Department of Forestry, Fiji. 1950. pp. 19.

Cf. *For. Abstr.* 12 (No. 3515).

62. WORKING PLANS. ANNUAL OR PERIODIC YIELD. YIELD REGULATION

560. Barnes, G. H. **A new method of volume regulation.** *J. For.* 49 (4), 1951 (272–7). 8 refs.

Describes and illustrates by detailed examples from the Douglas Fir region, a method of calculating allowable annual cut in forests with very irregular distribution of age classes. The 4 steps in the procedure are:—(1) computation of average weighted age of the growing stock, (2) determination of average cutting age (x), (3) computation of average weighted stocking (y) as % of normal, (4) calculation of allowable annual cut as the product of y and normal yield at age x. This method, in all three examples, gave better results than the application of empirical formulae.

561. Parente, E. Note sul trattamento a ceduo composto. **[The management of coppice with standards.]** *Monti e Boschi* 2 (4), 1951 (147–53). 2 refs. [It.f.e.]

Deals mainly with the numbers and age classes of standards to be reserved for different rotations for different species (Chestnut, Beech, Oak). [Cf. *For. Abstr.* 13 (No. 182).]

65. SPECIAL BUSINESS PROBLEMS OF TIMBER-GROWING. CALCULATION OF COSTS AND PROFITABILITY. VALUATION

See also Nos. 8, 196–7, 301, 309, 324, 881.

562. Ilvessalo, Y. Metsämaiden veroluokitus. **[Classification of forest lands for taxation.]** *Metsät. Aikak.* 1950 (6), (187–91). [Fi.e.]

In Finland, forest property is assessed on the basis of forested area and its quality, from which the average net yield of different site classes can be estimated. Average yield figures for the different classes were fixed by ordinance (from 1922) on the basis of the National Forest Survey. Each district was divided into stumpage-price zones, mainly on the basis of the hauling distance to the nearest consumption centre or long-distance transport route. A continual problem is the proper classification of forest land. The author proposes a classification system based on Cajander's forest site types and presents yield figures for different classes in 9 taxation zones (shown on a map), based on the new National Forest Survey and on data collected for preparing yield tables.

563. Arrigoni, A. L'estimation des taillis et des châtaigneraies lors des remaniements parcellaires. **[The valuation of coppice and Chestnut groves for the purpose of consolidation of scattered holdings.]** *Schweiz. Z. Forstw.* 102 (4), 1951 (201–15). [F.g.]

66. COSTING OF LOGGING OPERATIONS

See also Nos. 8, 361, 365.

564. Anttila, A. Kustannusten arvioiminen hankintahakkuissa. **[Assessment of logging costs.]** *Silva Fenn.* No. 64, 1948 (77–86). [Fi.]

In this lecture to a Forestry Officers' refresher course, the author points out that the State sells 3 to 4 times as much timber at stump as at depot and the higher depot prices will result in lower stumpage prices, and hence an all-over loss. With a view to more accurate costings, he gives a scheme of cost analysis from forest to estuary, by land and sea, and stresses the need for further data on headwater floating costs, particularly when the State is resuming activity in this field.

565. Hegardt, S. B. Arbetskraftsåtgång vid skogsarbete samt arbetskraftens verkliga kostnader. **[The expenditure of labour in forest work and its actual cost.]** *Svenska SkogsvFören. Tidskr.* 47 (4), 1949 (228–38). [Sw.sw.]

Results of an investigation by the Förening Värmlands Skogsarbetsstudier on felling and hauling time are discussed. The average time for felling 1 cu.m. sk. (volume in cu.m. of the entire stem inside the bark) in Värmland and Bergslagen is estimated at 2–3 working hours. For the same district, the working hours per man per year are estimated at 1,200 or roughly 190 days of 6·4 hr. The average felling outturn per man per year is estimated at *ca.* 520 cu.m. sk.; where conditions are difficult or workers inexperienced, the figure may be reduced by 10–15%. The mean hauling time for an average haul of 2 km. is estimated at 1 working hr. per cu.m. sk. and the hauling capacity per man per year at *ca.* 440 cu.m. sk. The indirect costs to the

forest owner, above the cost of wages, of providing living quarters on rent to workers amount to 30–50% of a feller's actual wages, since the rents obtainable do not go far to meet the owner's expenditure on buildings, taxes, insurance, etc.

566. DIENER, H. Untersuchungen über die Sortiments-Länge von Fichten-Tannen-Rundholz. **[Studies of the assortment lengths of Spruce and Fir logs.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (2), 1948 (395–434). 61 refs. [G.g.f.]

Analysis of Swiss sawmilling figures showed that 97% of constructional timber was converted into lengths of 10 m. or less, and only 1% into beams of 13 m. or over, but that sawmills purchase every year 825,000 cu.m. of logs 15–30 m. long. In view of the much greater expense and trouble of hauling very long logs, it is recommended that logs should be cross-cut in the forest and hauled as half-lengths.

567. VARIS, T. Miksi Itä-Suomessa käytetään pitkää paperipuuta. **[Why long lengths are used in cutting pulpwood in Eastern Finland.]** *Pap. ja Puu* 33*B* (4*a*), 1951 (152–5). [Fi.e.] P.R.

The main reasons given for cutting to lengths of 3 m. and over are: conformity with Swedish practice; the requirements of existing mills and machines; easier stacking of long lengths into high piles; and easier and cheaper bundling and sorting.

568. PÖYHÖNEN, K. Miksi Länsi-Suomessa käytetään lyhyttä paperipuuta. **[Why short lengths are used in cutting pulpwood in Western Finland.]** *Pap. ja Puu* 33*B* (4*a*), 1951 (155–7). [Fi.e.] P.R.

Pulpwood lengths of 2 m. are better for floating and for land transport and are more easily handled than 1-m. lengths. Existing barking drums are, however, unable to remove bark efficiently from unfloated 2-m. lengths. Two-metre pulpwood is therefore used when it can be floated, and 1-m. wood in other cases.

569. OOSTING, W. Kostprijs van dunnen en het maken van kleine sorteringen. **[Costs of thinning and making small assortments.]** *Ned. Boschb.-Tijdschr.* 23 (4), 1951 (103–6). [Du.]

Figures are given for the labour costs of thinning, trimming and hauling per cu.m., for different lengths and diameters of Larch, Pine and Spruce; and for the cost per piece for different species, of cross-cutting and barking small mine timbers, poles and posts, wood used in land reclamation etc.

67. ASSESSMENT OF FINANCIAL RESULTS; BOOK-KEEPING AND ACCOUNTANCY; BUSINESS STATISTICS; SHORT-TERM PLANNING AND FINANCING

See also No. 881.

570. BELL, E. A. **Some of the financial and taxation aspects of forestry.** *Scottish Landowner, Edinburgh* No. 58, 1950 (684–700).

Discusses income tax (Schedules A, B, D and profits tax), estate duty and accounts.

571. URQUHART, B. **The economics of small woodlands.** *Scottish Landowner, Edinburgh* No. 62 1951 (197–212).

Discusses briefly problems of surveys, finance and labour in the management of small woodlands and quotes two examples, showing acreages and financial returns.

572. SAMPAIO, J. SALAZAR. Para um estudo económico do montado de sobro no concelho de Grândola. **[An economic study of a Cork Oak stand in Grândola.]** *Bol. Junta nac. Cortiça, Lisboa* 13 (149), 1951 (115–24). [Port.]

A study of costs of tending, pruning, harvesting and transport, and of production and returns.

68. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also No. 847.

573. GUICHON, A. Le régime domanial des forêts des nouveaux départements des Antilles françaises. **[The state administration of the forests of the new departments of the French Antilles.]** *Rèv. for. franç.* 1951 (6), (432–47). [F.]

Discusses the administrative difficulties raised by the transformation (in 1946) of the French colonies of the Antilles into *départements*, and particularly the division of interest between the Administration des Eaux et Forêts and the Administration des Travaux Publics.

574. SACHS, A. VON. 'Das Oberforstamt'. **[Forest administration.]** *Forst u. Holz* 6 (6), 1951 (80–2). [G.]

Notes on the functions of a forest district supervisor (Revierverwalter) and the intermediary authorities (Mittlere Forstbehörde).

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

See also Nos. 358, 851, 862, 869–71.

575. BUCHHOLZ, E. Forstpolitische und holzwirtschaftliche Wandlungen in den osteuropäischen Ländern. II–IV. [**Changes in forest policy and forest industries in the countries of eastern Europe. II–IV.**] *Holz-Zentralblatt, Stuttgart* 76 (92; 99; 100; 105), 1950 (1008; 1081; 1093; 1145). [G.] M.O.W.

Notes, based on statistical information, on the forests and forest products industries of Bulgaria, Hungary, Albania, and Jugoslavia.

576. MOLTESEN, P. Indtryk av norsk skovteknologi. [**An impression of Norwegian forest technology.**] *Dansk Skovforen. Tidsskr.* 34 (2), 1949 (49–83). [Dan.]

Gives particulars of timber production, labour costs, methods, equipment and cost of transport, timber prices, sawmilling methods and machinery, seasoning, grading, wood-waste utilization and pulping.

577. BAKER, W. J. **Some factors involved in the promotion of Alder-using industries in Tillamook, Oregon.** *Spec. Rep. Ore. For. Prod. Lab.* No. 1, 1951. pp. 35. P.R.

72. THE QUANTITATIVE ASPECTS OF MARKETING. DEMAND, CONSUMPTION AND SUPPLY

See also Nos. 591, 593, 781, 851–6.

578. **Yearbook of forest products statistics 1950.** FAO, Washington. 1950. pp. 183. [E.F.Span.]

579. **Austrian timber industry.** *Timb. Tr. J.* 196 (3890), 1951 (2100–2).

Discusses a recent article from *The Austrian Economist* on proposed investment plans for the industry, with figures for output of sawn timber, plywood and fibreboard.

580. HALOPAINEN, V. Kivihiilen ja halkojen kilpailu suomessa vuosina 1927–1938. [**Competition between coal and firewood in Finland in 1927–1938.**] *Commun. Inst. for. Fenn.* 38 (3), 1950. pp. 71. 40 refs. [Fi.e.]

Cf. *For. Abstr.* 13 (Nos. 718, 791).

581. **Forest fuel production in Japan.** *Prelim. Stud. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 33, 1949. pp. 13.

582. HERTZLER, R. A. **Southern hardwoods for veneer and plywood.** *Sth. Lumberm.* 182 (2279), 1951 (44, 46, 48, 50).

The area of hardwoods in the Southern States is increasing, hardwood sawtimber volume, especially of the species most used for veneer, is decreasing, and quality is deteriorating. The use of hardwoods by the Southern wood-using industries exceeds the annual increment, and the greatest use is of the species (Gums, Poplar and Maple) most desired by the veneer industry. Figures showing these trends are given in graphs and tables. Group action by the industries concerned, to encourage research, development and education, and to improve marketing by log grading, is recommended.

583. SCHRADER, O. H., JR. **Nineteen fifty—a year of great expansion and development in the Douglas Fir plywood industry.** *Lumberm.* 78 (3), 1951 (69–70, 127).

Includes statistics of Douglas Fir plywood production since 1924 in Washington, Oregon and California.

584. HUEY, B. M. **Relation between the consumption of round timber and the production of ore in the metal mines of the northern Rockies.** *Res. Notes Nth. Rocky Mt. For. Range Exp. Sta.* No. 94, 1951. pp. 3.

Figures showing the consumption of round timber, the production of ore and the consumption of timber per ton of ore produced in the area during 1949, are tabulated. The average consumption per ton of ore is 0·818 cu. ft. Douglas Fir is the preferred species, orming 59% of the total, with Lodgepole Pine next at 23%.

585. WIKSTROM, J. H. **1950 pulpwood production drops.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 90, 1951. pp. 1.

Gives figures for pulpwood production in Montana, northern Idaho and N.E. Washington.

586. **Exports and imports from and into Australia.** *Aust. Timb. J.* 16 (12), 1951 (932–48).

Tabulates figures of exports and imports for 1949 and 1950 arranged under products, and, for sawn goods and logs, under species.

75. TRADE CUSTOMS AND USAGES

587. [BASSETT, E. W.] **The sale of Crown timber in British Columbia.** *Pulp Paper Mag. Can.* 52 (3), 1951 (274–6, 279, 281–2, 286, 288).

Discusses the procedures involved in licensing the sale of Crown timber to applicants and in fixing the price.

79. ECONOMICS OF THE WOOD INDUSTRIES

588. VENKAJEE, T. **Development of the paper industry in Assam.** *Pulp Paper Mag. Can.* 52 (4), 1951 (63–7).

Lists nearly 30 indigenous species suitable for mechanical pulp and discusses the possible uses of Bamboos and grasses for pulping, water and fuel, transport and labour, markets and the selection of a site for the industry.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also No. 862.

589. KOLLMANN, F. Holz. Ein Überblick über Arbeiten aus den Jahren 1944 bis 1948. [**Wood. A survey of papers published in 1944–48.**] *Holz Roh- u. Werkstoff* 9 (1), 1951 (27–35). 169 refs. [G.] P.R.

81. WOOD AND BARK: STRUCTURE AND PROPERTIES

810. *General Information on Woods*

See also Nos. 87–90, 111, 118, 216, 679, 686–7.

590. NORMAND, D. Atlas des bois de la Côte d'Ivoire. Tome I. [**Atlas of the timbers of the Ivory Coast. Vol. I.**] *Publ. Centre tech. for. trop.* No. 1, 1950. pp. 148 + 66 plates + map. [F.]

This first volume contains short general accounts of the wood of the genera dealt with, and microphotographs (×25 of transverse and ×55 of longitudinal sections) of some 132 species of wood from the Ivory Coast.

591. FOUARGE, J. Appropriation des bois congolais aux besoins de la métropole. [**The suitability of Congo timbers to the needs of Belgium.**] *Publ. Inst. nat. Étude agron. Congo belge* (*Sér. tech.*) No. 38, 1950. pp. 17. [F.] Also in *Bull. agric. Congo belge* 42 (1), 1951 (175–9).

A general discussion of the quality and quantities of timber needed by Belgium, followed by a table showing the physical and mechanical properties of 54 Congo species together with several temperate species for comparison.

592. REID, J. S. **Building timbers in New Zealand.** *For. Prod. Res. Notes N.Z. For. Serv.* 1 (1), 1950. pp. 28.

The more important properties of available timbers are discussed in relation to building, particularly light building construction. Apparent requirements for component parts of buildings are listed, together with the timbers which are considered suitable for use when properly graded, when seasoned and, where necessary, treated with preservatives, and thereafter protected and maintained according to their separate needs. *Author's summary.*

593. **New Guinea timber to become available.** *Aust. Timb. J.* 16 (11), 1950 (826–7, 829, 833–4, 837).

Describes the Trans-Busu timber area, which is to be offered to competitive tender, groups the species available according to strength, durability and other desirable properties, estimates the stocking in the main timber-bearing blocks and gives notes on the more abundant and important species.

594. **Specimen woods Nos. 183–5.** *Suppls.* to *Wood* 16 (3–5), 1951 (99–100; 139–40; 179–80).

Binuang (*Octomeles sumatrana*); Kefe (*Pterygota* sp.); and Mbembakofe (*Afzelia quanzensis*).

595. LAMB, G. N. **Foreign woods—origin, use, properties, nomenclature.** *Wood Prod.* 56 (2; 4), 1951 (24–5; 24–5).

(*a*) Abura (*Mitragyna ciliata*), Brazil-Nut (*Bertholletia excelsa*), Canarium (*Canarium schweinfurthii*), and Mora Amarilla (*Chlorophora tinctoria*).

(*b*) Laurel, Louro, Laurier (species from 13 genera of the Lauraceae and 13 genera of other families).

596. SCHMIDT, E. Übersee-Hölzer Nr. 26. Afrikanisches Padouk. [**Foreign woods No. 26. *Pterocarpus soyauxii* Taub.**] *Suppl.* to *Weltholzw.* 3 (2), 1951. pp. 2. [G.]

597. MOURANCHE, R. Note sur les bois de *Fagus* et de *Nothofagus*. [**A note on the woods of *Fagus* and *Nothofagus*.**] *Rev. int. Bot. appl. Agric. trop.* 31 (339/340), 1951 (81, 83, 84–90). 9 refs. [F.] P.R.

Discusses the general properties and differences in anatomical structure of woods of the two genera, and their uses.

598. **Brush Box [*Tristania conferta*].** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 4 (Spec. Issue), 1950 (2–4).

Includes notes on distribution, descriptions of the tree and the timber, and discussion of properties and uses.

811. *Structure. Identification*

See also Nos. 590, 597, 636, 808.

599. **Selected references to the identification and uses of trees and timbers of the world (excluding North America).** *Bibliogr. Ser. For. Prod. Aust.* No. 44, 1951. pp. 15. 233 refs. P.R.

600. **Selected references to methods of identifying timbers.** *Bibliogr. Ser. For. Prod. Aust.* No. 44*A*, 1951. pp. 3. 32 refs. P.R.

601. JANSSONIUS, H. H. **Wood-anatomy and relationship—taxonomic notes in connection with the key to the Javanese woods.** *Blumea, Leiden* 6 (2), 1950 (407–61). 7 refs. [E.] L.S.

Contains 35 notes on the key [see *For. Abstr.* 8 (No. 287)], dealing mainly with anatomical relationships between families. There is an index to the species, genera and families discussed.

602. JANSSONIUS, H. H. **The variability of the wood-anatomy in large and small genera.** *Blumea, Leiden* 6 (2), 1950 (462–4). [E.] L.S.

Study of 991 Javan species showed that variations within a single species in the large genera are often wider than variations between different species of the smaller genera. Examples are quoted for species of *Dysoxylon*, *Aglaia*, *Eugenia*, *Myrsine*, *Litsea*, *Glochidion*, *Ficus*, *Quercus* and *Engelhardtia*. The differences may possibly be due to the fact that the large genera are more recent and that few intermediate forms and species have become extinct.

603. GREGUSS, P., and VARGA, I. Xylotomischer Bestimmungsschlüssel der Pinus-Arten. [**Anatomic key to the identification of Pine species.**] Botanisches Institut der Universität, Szeged. 1950. pp. 162 + 1 tbl. 25 refs. [G.russ.]

An excerpt from a larger work in preparation, *Die Xylotomie der Koniferen*, by P. Greguss. The 68 Pine species described are divided into 9 groups typified by : *Pinus cembra*, *P. strobus*, *P. aristata*, *P. massoniana*, *P. radiata*, *P. pinea*, *P. sylvestris*, *P. banksiana*, and *P. ponderosa*.

604. ADAMS, J. E. **Studies in the comparative anatomy of the Cornaceae.** *J. Elisha Mitchell sci. Soc.* 65 (2), 1949 (218–44). 28 refs. L.S.

605. DADSWELL, H. E., and INGLE, H. D. **Wood anatomy in the genus *Eucalyptopsis* White.** *J. Arnold Arbor.* 32 (2), 1951 (150–1 + 1 plate).

The absence of vasicentric tracheids and of fibre tracheids in the new genus [cf. *For. Abstr.* 13 (No. 113)] indicates a close affinity with genera of one section of the *Eugeniinae*, viz. *Syzygium*, *Piliocalyx*, *Acmena* and *Cleistocalyx*, rather than the other section which includes *Eugenia* (*sensu strictiore*). The presence of predominantly paratracheal parenchyma and the high % of vessel multiples also substantiates this view. On the other hand the type of ray is unlike that predominating in the section Eugeniinae, and also in the great majority of genera of the Myrtoideae, and in this feature, as also in the vessel-ray pitting, there is a somewhat striking resemblance to the section Eucalyptinae of the Leptospermoideae.

606. TITMAN, P. W. **Studies in the wood anatomy of the family Nyssaceae.** *J. Elisha Mitchell sci. Soc.* 65 (2), 1949 (245–61). 29 refs. L.S.

811.1. Anatomical Elements and Tissues

See also No. 777.

607. SUSMEL, L. Dimensioni e proporzioni degli elementi istologici nel legno di *Picea excelsa* Link. [**Sizes and relative numbers of the histological elements in Norway Spruce wood.**] *Ital. for. mont.* 6 (2), 1951 (67–75 + 6 plates). 17 refs. [It.it.f.]

Presents data collected from 7,000 measurements of Spruce wood from alpine selection forest, covering the length, diameter and pits of tracheids, the thickness of membranes, number and size of bordered pits, parenchyma rays and resin canals. It was found that the membrane thickness and mean length of tracheids of the trees examined were much greater than those of trees grown further north (in Sweden).

608. BANNAN, M. W. **The reduction of fusiform cambial cells in *Chamaecyparis* and *Thuja*.** *Canad. J. Bot.* 29 (1), 1951 (57–67 + 24 dgms.). 12 refs. P.R.

The loss of fusiform initials from the cambium, which is of frequent occurrence in all parts of the tree, takes place in different ways. Some cambial cells seem gradually to fail and are shortly lost from the cambium by maturation into more or less imperfect xylem or phloem elements. The majority are transversely subdivided by one or a succession of anticlinal divisions which begin near the centre of the fusiform initial and usually extend to the daughter cells. The resulting segments shorten through the following periclinal divisions, some disappearing during the process of shortening and others undergoing transformation to ray initials. Nearly all new rays in the secondary body originate in this manner. *Author's summary.*

609. JACQUIOT, C. Sur la culture *in vitro* de tissu cambial de châtaignier (*Castanea vesca* Gaertn.). [**The culture *in vitro* of cambial tissues of *C. sativa*.**] *Repr.* from *C.R. Acad. Sci., Paris* 231, 1950 (1080–1). 2 refs. [F.f.] X.

Cultures on a medium containing β-indole-acetic acid and vitamins have been subjected to transplanting 7 times. After the 5th transplanting, a series of cultures was established on a medium lacking the hetero-auxin, but containing inositol. These cultures proliferated with exceptional vigour, and the effect lasted through the next 2 transplantings. [Cf. *For. Abstr.* 11 (No. 2545).]

610. JANSSONIUS, H. H. **The vessels in the wood of Javan Mangrove trees.** *Blumea, Leiden* 6 (2), 1950 (465–9). [E.] L.S.

Examination of about 20 Mangrove species and about 40 related species shows that while the former vary considerably in general wood structure they are alike in having a much greater number of vessels per sq. mm. than non-Mangrove species. Tables are given showing radial and tangential diameters of vessels and the number of vessels per sq. mm.

611. REINDERS, E. **Fibre tracheids and libriform fibres.** *News Bull. int. Ass. Wood Anatomists* Feb., 1951 (2–6). [E.] X.

Discusses the characteristics of fibre tracheids and libriform fibres, and possible definitions.

612. VAROSSIEAU [W. W.]. **On the distinction between fibre-tracheids and libriform wood fibres.** *News Bull. int. Ass. Wood Anatomists* Feb., 1951 (6–9). 4 refs. [E.] X.

Discusses definitions proposed, and summarizes them in tabular form.

613. CHATTAWAY, M. **Morphological and functional variations in the rays of pored timbers.** *Aust. J. sci. Res.* 4*B* (1), 1951 (12–27 + 11 photos). 11 refs. P.R.

The rays of pored timbers may be made up of cells of very diverse forms and functions, and may form a horizontal tissue system as varied as the vertical system of the wood. Differences in structure between ray cells are described and their development from the cambial initials is discussed. A distinction is drawn between changes that occur in the ray initials themselves and those developing during the differentiation of the daughter cells. The influence of cell contents on the shape, size and pitting of the ray cells and the reversible nature of changes affecting the cambial initials are discussed. It is suggested that the stimuli causing the change from one type of ray initial to another are as likely to be found in the phloem as in the wood and that in further studies of ray development more attention must be paid to phloem. *Author's summary.*

614. CHATTAWAY, M. M. **Homogeneity in rays.** *News Bull. int. Ass. Wood Anatomists* Sept., 1949 (1–8 + 11 photos, 26 drawings). X.

The terms 'homogeneous' and 'heterogeneous' as applied to rays are discussed, and new definitions are suggested. [Cf. *For. Abstr.* 12 (No. 362).]

615. REINDERS-GOUWENTAK, C. A. **Ray terminology in wood anatomy.** *Repr.* from *Proceedings, Koninklijke Nederlandse Akademie van Wetenschappen* 53 (8), 1950. pp. 12. 9 refs. [E.e.] X.

Existing definitions of homogeneous and heterogeneous rays are discussed and a new definition is given.

616. REINDERS-GOUWENTAK, C. A. **On the structure of wood rays.** *News Bull. int. Ass. Wood Anatomists* Feb., 1951 (19–25). 6 refs. X.

617. **Parenchyma.** *News Bull. int. Ass. Wood Anatomists* Feb., 1951 (10–8). [E.F.] X.

A discussion on terminology.

811.2. Special Features and Abnormal Structure

618. COZZO, D., and CRISTIANI, L. Q. **Los géneros de fanerogamas argentinas con estructura leñosa estratificada. [Genera of Argentine phanerogams having wood with storeyed structure.]** *Revista del Instituto Nacional de Investigación de las Ciencias Naturales anexo al Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia', Ciencias Botánicas* 1 (8), 1950 (363–405 + plates). 16 refs. [Span. span.e.] X.

Presents a key to 82 genera showing storeyed structure, and describes briefly the anatomical characters of each genus. The Leguminosae are best represented, with 52 genera. Three types of storeyed structure are distinguished:—(1) complete, with all elements storeyed, (2) rays incompletely storeyed—small rays and other tissues storeyed, but not large rays, and (3) partial—no rays storeyed. The following terminology is suggested for the height of the storeys:—

Low:
very low . up to 100 μ (Ray Marks up to 250/in.)
moderately low 100–150μ (R.M. 250–160)
Medium: . . 150–200μ (R.M. 160–125)
High:
moderately high 200–250μ (R.M. 125—100)
very high . over 250μ (R.M. under 100)

811.5. Sapwood and Heartwood

619. YAZAWA, K. **The relation of heartwood diameter and percentage sapwood to log diameter for Sugi (*Cryptomeria japonica* D. Don) in Nara and Miyazaki prefectures.** *J. Jap. For. Soc.* 30 (1/2), 1948 (14–9). [Jap.e.]

Equations are given for the relation of heartwood diameter to log diameter for both origins and their correlation coefficient. For a given log diameter, the heartwood diameter of Sugi is smaller than that of most Japanese softwoods.

811.6. Texture, Grain, Figure

620. ROSS, W. **Classification of grain.** *B.C. Lumberm.* 35 (3), 1951 (56).

Definitions are given for terms including the word grain, grouped under: arrangement or direction of fibres, arrangement or direction of annual rings, relative width of annual rings, texture (in woodworking), and manufacturing irregularities.

621. MEYER, K. A. **Sprachliche und literarische Bemerkungen zum Problem 'Drehwuchs'. [Linguistic and bibliographical notes on the problem of twisted fibre.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 26 (1), 1949 (331–47). [G.g.f.]

Completes the earlier review of the subject by Burger [cf. *For. Abstr.* 4 (110)], recapitulates the principal theories on the origin of twisted fibre, and discusses the urgent need for standardizing the use of the terms 'left' and 'right' in this connexion.

812. *Physical and Mechanical Properties*

See also Nos. 157, 591.

622. SUZUKI, Y. **Studies on the Bamboo (V). Individual differences and variations due to the locality found in physical properties of *Phyllostachys pubescens* Magel et H. de Lehaie.** *Bull. Tokyo Univ. For.* No. 38, 1950 (165–77). [Jap.e.]

Studies on 33 culms from different localities in Japan revealed: (1) Marked variations between individual culms from the same stand, but significant differences in average density and bending strength with locality, these being greater than the individual differences. (2) Regular vertical variation in density and bending strength for most culms. Average values of density and bending, tensile and shear strengths at the 10th internode, with maximum and minimum values, are tabulated.

623. SUZUKI, Y. **Studies on the Bamboo (VI). Dependence of the mechanical properties of *Phyllostachys pubescens* Magel et H. de Lehaie upon the moisture content.** *Bull. Tokyo Univ. For.* No. 38, 1950 (179–86). 3 refs. [Jap.e.]

Results of experiments are tabulated. The relationships between the moisture content of oven-dry, air-dry and green culms, and bending, cleavage, shear strength, and hardness, resemble those for wood, but the differences of strength between the air-dry and green condition are comparatively small, especially for bending and cleavage.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

624. **[Thermal properties of some Indian timbers.]** *For. Res India Burma 1947–8*, 1950 (60).

Some experiments were made on the penetration of heat into timber exposed to infra-red radiation. In the preliminary tests it was remarked that the rate of rise of temperature is dependent not only on the density of the timber but also on its colour and other factors. Thus, though *Bombax malabaricum* is lighter in weight than *Shorea robusta*, the time taken for the centre of specimens of the same size to rise to the same temperature was about the same—90–98 minutes for the conditions of the test. With Mango the time was 130 and with Mulberry 150 minutes. The capacity of various species to reflect infra-red radiation was also investigated. It was noticed that the lighter-coloured woods usually had the higher reflectivity.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 623, 759.

625. SCHULZ, F. **Geräte zur Feuchtigkeitsmessung in der Holzindustrie. [Moisture meters in the timber industry.]** *Holz Roh- u. Werkstoff* 9 (4), 1951 (145–51). 10 refs. [G.g.] P.R.

Describes the principles and construction of air hygrometers, psychrometers, wood hygrometers and electrical moisture meters, of German manufacture.

626. LIIRI, O. **Sänköisista puun kosteuden mittareista. [Electrical moisture meters for wood.]** *Pap. ja Puu* 33*B* (4*a*), 1951 (126–32). 11 refs. [Fi.e.] P.R.

Readings were taken in the State Institute for Technical Research, Helsinki, from specimens of *Pinus sylvestris*, *Picea abies* and *Betula verrucosa* of uniform moisture content but of varying specific gravity, using two meters based on measurement of the di-electric properties and one based on measurement of the electrical resistance of wood. The results, shown in graphs, indicate that no great difference exists between the two types of meter. The specific gravity has a considerable influence on the results, but, with practice, allowances can be made satisfactorily for this.

627. MOTTET, A. L., and RING, W. C. **The comparison of electrical meter tests with oven tests as a measure of moisture content in lumber.** *For. Cl. Quart.* 24 (2), 1951 (15, 18–21).

A comparison was made on 100 samples of 1-in. Douglas Fir lumber, of the results obtained by determining moisture content (1) by readings taken with a Model 8002 Tag-Heppenstall resistance-type moisture meter, and (2) by the oven test method. The data obtained indicate that, within the conditions of the experiment, properly conducted meter testing is as accurate as, and much quicker than, oven testing. The Long Bell Lumber Co. (Kansas City, Missouri) for which the investigation was made, has now adopted meter tests in precision testing of moisture content of factory lumber.

628. GARCIA, J. J. M. Contenido de humedad en árboles vivos. **[Moisture content of living trees.]** *Publ. téc. Minist. Agric. Argent.* No. 14, 1951. pp. 16. 6 refs. [Span.]

Presents the results of tests on 28 Argentine species, done in July from physiologically active trees. With some exceptions the moisture content at the base tends to be greater than that at the top of the stem, and greater in the sapwood than the heartwood.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 553, 622.

629. HENNIG, R. Über das Raumgewicht und seine Bestimmung bei kleinen Holzproben. **[Weight per unit volume and its determination for small wood specimens.]** *Weltholzw.* 3 (3), 1951 (57–8). [G.] P.R.

An analysis of the accuracy of the block method and the mercury method of determining the density of wood is followed by an account of tests carried out to evaluate the sources of error in the mercury method. The results seem to indicate that the error depends on the average size of pores.

630. HIRAI, S. **Studies on the variation in wood density in the stem of Japanese Larch.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (124–54). 15 refs. [Jap.e.]

Density within the individual tree and between trees ranged from 0·95 to 0·36 for green and from 0·68 to 0·27 for dry wood. In general, it ranged from 0·96 to 0·89 for green and from 0·39 to 0·38 for dry sapwood, and from 0·51 to 0·53 for green and from 0·40 to 0·41 for dry heartwood. The densities for the transition zone were intermediate. Density of dry sapwood and of green and dry heartwood decreased gradually with increasing age of tree, but no relationship was found between age and the density of green sapwood. Dominant trees in a stand generally showed lower density of dry sapwood and green and dry heartwood, but there was no relationship between dominance and the density of green sapwood. Density did not vary regularly with the chronological sequence of annual rings. A ring with high density maintained it from butt to tree top. The density of green heartwood was rather lower midway up the stem, otherwise there was little variation with height in stem. There appeared to be some variation in density with the aspect of the tree. The density of summer and spring wood ranged respectively from 1·00 to 0·81, and from 1·09–0·66, with averages of 0·92 and 0·97 for green sapwood; corresponding figures for green heartwood were 0·83 to 0·65 and 0·53 to 0·39 with averages 0·72 and 0·44 respectively. *From author's summary.* [Cf. *For. Abstr.* 13 (No. 553).]

812.7. Strength Properties

See also Nos. 622–3, 733.

631. KLAUDITZ, W. Über die mechanischen Eigenschaften und chemische Zusammensetzung des Stammholzes zweier Pappelhybriden. **[Mechanical properties and chemical composition of the stem wood of two Poplar hybrids.]** *Holz Roh- u. Werkstoff* 9 (3), 1951 (81–4). 11 refs. [G.g.] P.R.

Comparative measurements were made of the tensile, bending, and compressive strength of *Populus regenerata* 'Harff' (I) and *Populus* 'Eucalyptus' (II) which differ from one another both in chemical composition and growth properties. Wood of the hybrid I contains more cellulose and lignin and has a greater mechanical strength than that of the quicker growing hybrid II.

632. STILLINGER, J. R. **Some strength and related properties of old-growth Douglas Fir decayed by *Fomes pini*.** *Bull. Amer. Soc. Test. Mat.* No. 173, 1951 (52–8). 3 refs. P.R.

Data on static bending, compression, shrinkage, hardness, and nail-holding properties.

633. BELL, E. R., PECK, E. C., and KRUEGER, N. T. **Young's modulus of wood determined by a dynamic method.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1775, 1950. pp. 5 + 2 dgms., 3 tbls. 3 refs. P.R.

Young's modulus was determined by the transverse-vibration method for 6 specimens of Southern Yellow Pine, Sitka Spruce, and Oak, at a moisture content of *ca.* 9%. The values obtained when the specimens were vibrated in the tangential direction were some 4% greater than those obtained by the static-bending method; in the radial direction the increase was *ca.* 8%. In the Sitka Spruce specimen the modulus as determined by the dynamic method was less than that determined by static bending. Results of transverse-vibration tests in the tangential direction on 40 specimens from second-growth Douglas Fir at 12% moisture content gave values of Young's modulus that were consistently higher (*ca.* 10·3%) than those obtained by static bending. Thirteen specimens of second-growth Douglas Fir

t a moisture of 12% gave values of Young's odulus by the longitudinal-vibration method that ere (with the exception of one specimen) *ca.* 10·4% reater than those determined by the static bending.

34. KITAHARA, K. **On the calculations of the bsorbed energy of wood in the impact bending test.** *ull. Tokyo Univ. For.* No. 38, 1950 (153–63). [Jap.e.] Impact-bending tests were done on *Chamaecyparis btusa*, *Tsuga sieboldii* and Masonite with span, idth and height of the test piece as variables. esults are shown in graphs and tables, and a rmula is presented for calculating the energy nsumed when the span/height ratio of the test ieces is constant.

35. PILLOW, M. Y. **Mandrel bending tests for ircraft veneer.** *Rep. U.S. For. Prod. Lab., Madison* o. *R*1788, 1950. pp. 4. 1 ref. P.R. Describes the mandrel bending test developed at adison for determining whether slopes from the ane of the veneer sheet to be used in aircraft ywood are acceptable, without depending on bjective judgments based only on the appearance f the veneer.

36. KISSER, J., and FRENZEL, H. Mikroskopische Veränderungen der Holzstruktur bei mechanischer Überbeanspruchung von Holz in der Faserrichtung. [**Microscopic changes in wood structure as a result of mechanical overstressing along the grain.**] *SchrReihe öst. Ges. Holzforsch.* No. 2, 1950 (7–31). 13 refs. [G.g.] P.R. Presents the results of an investigation conducted in Austria during the past few years. The photomicrographs of thin wood sections were taken at magnifications between 750× and 1,200×. The preparations were usually unstained, the required contrast being obtained by using testing liquids with appropriate refractive indices (over 1·48), mostly benzene, clove oil, saffrol, and Styresin. Other methods include: the use of a polarizing microscope; treatment with 'chlorzinc iodide' and also with various stains. During mechanical over-stressing of wood along fibres, the latter are first compressed up to the limit of elasticity of their membranes; when this limit is exceeded, the membranes yield, and the destruction of their fine structure manifests itself in the form of lines that run obliquely in layers of the secondary wall but do not extend to the inner lamella. These lines cannot be stained, but may be observed by using liquids with appropriate refractive indices. As the excessive stress increases, the lines bend to the inner lamella, and sometimes into the secondary wall of the adjacent cell, without, however, injuring the lamella itself. At the same time, the membrane material is displaced around these lines, and they can then be made visible by staining. When this stage is reached, the cell becomes plastic and the unequal reaction of the various cell elements results in internal stresses. Microscopic investigation of various kinds of wood has shown that the appearance of the lines of failure and of slip lines in fibre walls is characteristic of all woods subjected to excessive compression along the grain.

. ARMSTRONG, F. H. **Abrasion tests of some recently introduced hardwoods. 1–3. [Resistance to wear as flooring.]** *Wood* 16 (3–5), 1951 (90–1; 130–1; 176–7).

(1) Kwao (*Adina cordifolia*) from Siam possesses a high degree of resistance to wear; it may be classed with other fine-textured hardwoods of the same density. [Cf. *For. Abstr.* 10 (No. 279).]

(2) Muhimbi (*Cynometra alexandri*) has very high resistance to abrasion. It is slightly superior to many of the better-quality, fine-textured hardwoods and should prove very suitable for industrial and other heavy-duty flooring.

(3) Krabak (*Anisopfera* spp.) has a relatively low resistance to wear. It is best suited for light traffic in domestic or other buildings, used in either wood-block or wood-strip form.

813. *Wood Chemistry*

See also Nos. 55, 631, 754.

638. WEST, C. J. [Editor]. **Nature of the chemical components of wood.** *Tappi Monograph Series* No. 6, 1948. pp. [3 +] 234. 118 refs. P.R. Contains papers presented at a symposium held at the Institute of Paper Chemistry, Appleton, Wis., 3 to 5 September, 1947, dealing with: (1) unsolved cellulose problems, (2) the hemicelluloses, (3) structural analysis of the polysaccharides—gums and mucilages, (4) the proven chemistry of lignin, (5) phenolic constituents of wood, (6) wood tannin, (7) wood resins, (8) review of natural colouring matters in wood, and (9) structure and synthesis of gymnosperm lignin.

639. JENSEN, W. Institutet för träkemi vid Åbo Akademi, verksamheten 1950–1951. [**The work of the Institute of Wood Chemistry at Abo Academy, 1950–1951.**] *Pap. ja Puu* 33*B* (4*a*), 1951 (163–5). [Sw.] P.R. Discusses research on the chemistry of the outer bark and of the cork of Birch, and on the use of Birch for pulping. [Cf. *For. Abstr.* 12 (No. 3184).]

813.1. Chief Organic Constituents. Constituents of the Cell Wall

640. BLAND, D. E., HO, G., and COHEN, W. E. **Aromatic aldehydes from the oxidation of some Australian woods and their chromatographic separation.** *Aust. J. sci. Res.* 3*A* (4), 1950 (642–8). 8 refs. P.R. The mixtures of aromatic aldehydes produced from 12 species of Eucalypt woods and 8 Australian gymnosperm woods by oxidation with nitrobenzene and alkali were separated by sublimation and the individual aldehydes identified. The Eucalypt woods all yielded vanillin, syringaldehyde, and traces of *p*-hydroxybenzaldehyde. The gymnosperm woods yielded mainly vanillin but traces of syringaldehyde were produced from some and traces of *p*-hydroxybenzaldehyde from most. *From authors' summary.*

641. WACEK, A. VON, and SCHROTH, D. Über die Analyse eines Tropenholzes (*Entandrophragma utile*) und die Bestimmung des Ligningehalts von Hölzern. [**Analysis of a tropical wood (*E. utile*) and determination of the lignin content of woods.**] *Holz Roh- u. Werkstoff* 9 (1), 1951 (7–11). 29 refs. [G.g.] P.R.

Gives the results of an analysis of the wood of *E. utile* (extractives, methoxyl content after extraction, acid lignin determination, degumming, methoxyl content after degumming, holocellulose, and cuproxam lignin). Discusses the various methods of determination of lignin. The amount of methoxyl missing in acid lignin was quantitatively found again in protolignin I, which might be a part of wood lignin from the last period of vegetation, transformed later into protolignin II. The total lignin content is a sum of sulphuric-acid lignin from degummed wood plus lignin dissolved during degumming. *From authors' summary.*

642. GUSTAFSSON, C., SARKANEN, K., KAHILA, S., and NISKASAARI, E. **Attempts to isolate dimeric ethanolysis products of Spruce and Birch lignins.** *Pap. ja Puu* 33*B* (4), 1951 (74–9). 10 refs. [E.e.] P.R.

813.2. Minor Organic Constituents. Extractives

See also Nos. 785–6.

643. LINDSTEDT, G. **Constituents of Pine heartwood. XXIII. Isolation of dihydropinosylvin monomethyl ether from the heartwood of *Pinus albicaulis* Engelm.** *Acta chem. scand.* 4 (8), 1950 (1246–9). 2 refs. [E.e.] O.R.S.

644. ERDTMAN, H., FRANK, A., and LINDSTEDT, G. **Constituents of Pine heartwood XXVII. The content of pinosylvin phenols in Swedish Pines.** *Svensk PappTidn.* 54 (8), 1951 (275–9). 10 refs. [E.e.] P.R.

[Cf. *For. Abstr.* 12 (Nos. 3036–43).] The content of pinosylvin phenols was estimated for heartwood of 269 trees of *P. sylvestris* from all parts of Sweden. The average content is *ca.* 0·9%. The phenols are evenly distributed along the axis of the trunk, but are generally present in greater quantity in the periphery than at the centre of the heartwood. The phenol content is highest in Pines from southern and lowest in those from central Sweden (Jämtland). In trees from northern Sweden it is slightly below the average for the whole country. Altitude appears to have no effect on the phenol content. About 3% of all the trees had a phenol content higher than 1% evenly distributed throughout the heartwood. The colorimetric method used to determine the phenol content could, with modifications, be used for the field assessment of durability of Pine timber.

645. KURTH, E. F. **Methyl ester of dehydroperillic acid, an odoriferous constituent of Western Red Cedar.** *J. Amer. chem. Soc.* 72 (12), 1950 (5778–9). 2 refs. [Oregon Forest Products Laboratory.] O.R.S.

Fragrant crystals found in sawlogs of *Thuja plicata* were identified as the methyl ester of dehydroperillic acid, probably the chief odoriferous constituent of the wood. [Cf. *For. Abstr.* 11 (No. 1129).]

646. ROBERTSON, A., SUCKLING, C. W., and WHALLEY, W. B. **The chemistry of the 'insoluble red' woods. Part III. The structure of Santal and a note on orobol.** *J. chem. Soc.* June, 1949 (1571–8). O.R.S.

The woods dealt with are *Baphia nitida*, *Pterocarpus santalinus* and *Erythrophleum.* [Cf. *For. Abstr.* 2 (p. 143).]

647. BADCOCK, C. G., CAVILL, G. W. K., ROBERTSON, A., and WHALLEY, W. B. **The chemistry of the 'insoluble red' woods. Part IV. Some mixed benzoins.** *J. chem. Soc.* Nov., 1950 (2961–5). [University of Liverpool.] O.R.S.

From *Baphia nitida* and *Pterocarpus santalinus.*

648. KING, F. E., KING, T. J., and WARWICK, A. J. **The chemistry of extractives from hardwoods. Part III. Baikiain, an amino-acid present in *Baikiaea plurijuga*.** *J. chem. Soc.* Dec., 1950 (3590–7). O.R.S. [The University, Nottingham.]

Baikiain, present chiefly in the water-soluble fraction of the timber, has been shown to be *l*-1 : 2 : 3 : 6-tetrahydropyridine-2-carboxylic acid.

649. KING, F. E., and KING, T. J. **The chemistry of extractives from hardwoods. Part IV. Okanin and *iso*okanin, the isomeric 2 : 3 : 4 : 3′ : 4′-pentahydroxychalkones.** *J. chem. Soc.* Feb., 1951 (569–71). [The University, Nottingham.] O.R.S.

The two colouring matters, okanin and *iso*okanin, have been isolated from the yellowish-brown heartwood of the West African tree, *Cylicodiscus gabunensis.*

650. KING, F. E., and GRUNDON, M. F. **The constitution of chlorophorin [extracted from the heartwood of *Chlorophora excelsa*]. Part II. Further oxidation experiments and the completion of the structural problem.** *J. chem. Soc.* Dec., 1950 (3547–52). [The University, Nottingham.] O.R.S.

Cf. *For. Abstr.* 12 (No. 1192).

651. SIMES, J. J. H. **The constituents of the wood of *Castanospermum australe* Cunn. et Fras. Part I. The isolation of a new sapogenin, castanogenin.** *J. chem. Soc.* Oct., 1950 (2868–70). [Sydney Technical College, N.S.W.] O.R.S.

814. *Natural Durability. Old Wood. Fossilized Wood*

See also Nos. 644, 756–7.

652. GÄUMANN, E. Der Einfluss der Meereshöhe auf die Dauerhaftigkeit des Lärchenholzes. **[The influence of altitude on the natural durability of Larch [heart]wood.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (2), 1948 (327–93). 20 refs. [G.g.f.]

Specimens of heartwood of Larch taken from 75 trees of about the same d.b.h. and growing at various altitudes between 460 and 2,100 m. were tested for their resistance to *Polyporus vaporarius* (*Poria vaillantii*). In any one stem, the resistance to decay of the comminuted heartwood as measured by loss of dry substance (method described in detail) increased from the base to a point about midway up its length and then diminished somewhat towards the top; it is generally *ca.* 5% greater at a height of 9–13 m. than at 3–7 m. above ground level. Comparison of stems of the same d.b.h. from different altitudes gave optimum durability values for trees grown at about 1,100 m., with inferior durability in trees grown at lower and at higher levels, but the governing factor is not in fact the elevation of the

te but the age of the tree, since trees of the same .b.h. at different altitudes are of different ages. In ct heartwood of trees grown on the high moun- ins was found to be more durable than that of trees f the same age grown on the plains. It appears at Larch stands on the higher sites (over 1,500 m.) e for the most part biologically overmature, veraging twice the age of those on the plains. umerous graphs illustrate these various relation- ips.

815. *Effect of Growth Factors on Structure and Properties*

See Nos. 155, 157, 553, 622, 630, 652, 768.

82. CONVERSION, SHAPING, ASSEMBLY AND FINISHING OF WOOD: GENERAL

See also Nos. 710–1.

53. **New aids to production.** *Wood* 16 (3), 1951 10–1).

Discusses with illustrations a few of the examples f woodworking equipment from the 1951 British urniture and Allied Trades Exhibition.

54. **Exhibitors to the lumber and woodworking dustries.** *Timber of Canada* 11 (9), 1951 (35–8).

Describes briefly woodworking machinery, equip- ent for manufacturing veneer and plywood, rope- ay models, lift trucks and belt conveyors, shown by 0 firms, mostly British, at the Canadian Inter- ational Trade Fair.

822. *Saws and Sawing*

See also No. 576.

55. REINEKE, L. H. **Forest Products Research linic. Problem No. 3. Can you explain the action f circular saw teeth in the saw kerf of a board uring the ripping operation?** *Wood-Worker, Indianap.* 0 (1), 1951 (44).

56. **'Surging' band saws.** *Timb. Tr. J.* 196 (3889), 951 (1958–9).

Discusses the effects and correction of surging— he movement of band saws when they oscillate on he wheels.

57. MCINTOSH, W. G., and CHURCH, J. W. **eport on small sawmilling equipment. A com- endium of edgers, trimmers and relative information n other secondary equipment and supplies.** *Report, esearch Council of Ontario, Toronto* No. 4–1–50 [1950]. pp. v–viii + 56–102 + [8] + 9 plates.

A complete survey of the small sawmilling equip- ent available in Canada. Out of 48 types of achine, 30 are of U.S.A., and 18 of Canadian anufacture. [Cf. *For. Abstr.* 12 (No. 482).]

58. **New Foley automatic power saw setter.** *Wood-Worker, Indianap.* 70 (2), 1951 (72). P.R.

The saw setter is of a twin-hammer type so that oth sides of the saw are set in one run through the achine. It is claimed that a 26-in., 8-point hand w is set in 32 sec.

59. Schwenkschliff-Sägenschärfmaschinen in heorie und Praxis. **[Swinging-disc-type saw- harpening machines—theory and practice.]** *Holz- chnik* 31 (5), 1951 (143–4). [G.] P.R.

The operation of 'plunger-type' (straight-line travel of the grinding wheel) saw-sharpening machines is compared with that of the 'swing-type' (wheel travelling in a short arc). The latter, it is claimed, has been so improved that its grinding qualities are comparable, while, owing to the smoothness of feed, it can sharpen faster.

823. *Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning*

660. LISTER, S. **Planers and planing.** Lomax, Erskine & Co., Ltd., London. 1947. pp. 93 + vii Many dgms. Price 5*s*.

Illustrated descriptions and explanations, in alphabetical order, of machines, tools, and operations used in the planing of wood.

661. DICK, M. E. **Tips on planer maintenance.** *Wood, Chicago* 6 (5), 1951 (20–1, 38–9, 41). P.R.

Practical hints on the care and maintenance of planing and surfacing equipment.

662. BÖTTCHER, P. Neuerungen an Zapfen- schneidmaschinen. **[Improvements in tenoning machines.]** *Holztechnik* 31 (5), 1951 (137–9). [G.] P.R.

Description of a one-sided, and an automatic two-sided, tenoning and slotting machine characterized by the universal adjustability of the two axles which can be made to work horizontally, vertically, or in an inclined position.

663. **[Boring holes.]** *Wood-Worker, Indianap.* 70 (3), 1951 (41). P.R.

The secret of boring holes of great depth without any leading tendencies lies in the use of good support for the boring bit and high operating speeds. Hardened steel bushings are generally employed for proper support, and speeds sometimes as high as 15,000 revs./min.

664. PRATTEN, F., AND COMPANY LIMITED, and WOODLAND, W. A. **Improvements in devices for setting cutting tools in woodworking and like cutter heads.** *British Pat.* No. 652,849, May 2, 1951. pp. 3. P.R.

A device for the accurate setting of more than one cutting tool at the same distance from the axis of rotation of the cutter head.

824. *Forms of Joint. Jointing and Assembly*

824.1. Nailed Joints

See also No. 703.

665. STERN, E. G. **Improved nails for building construction.** *Bull. Va. polyt. Inst.* 43 (6), 1950. pp. 23. P.R.

Without a single exception, grooved nails were found to be far superior in holding capacity to the corresponding plain-shank nails.

666. STERN, E. G. **Comparative withdrawal tests establish nail clinching effects.** *Sth. Lumberm.* 182 (2281), 1951 (52,54). Also in *Timber News* 59 (2142), 1951 (155–6).

Clinching increased the holding power of all nails tested; maximum withdrawal resistance was obtained with clinched helically grooved Screwtite nails.

824.8. Glues and Gluing

See also Nos. 692 *et seq.*

667. KÜCH, W. Leime. Ein Überblick über Arbeiten aus den Jahren 1944 bis 1948. [**Glues: a survey of papers published in 1944–48.**] *Holz Roh- u. Werkstoff* 9 (1), 1951 (35–9). 59 refs. [G.] P.R.

668. **Sampling and testing vegetable adhesives.** *Brit. Stand.* No. 844, 1951. pp. 16. P.R.

669. GOTŌ, R., and KŌZAI, Y. **Studies on adhesion for woods. II. Application of acetone-formalin resin as adhesives. 2.** *Wood Res., Kyoto* No. 4, 1950 (62–5). [Jap.e.]

The adhesive has a moderate water resistance. The optimum specific pressure is 18 kg./sq. cm. Pressing temperatures, above 80° C. do not affect the pressing time. The wet adhesive strength is about 30 kg./sq. cm. Results are given in graphs and tables. [Cf. *For. Abstr.* 12 (No. 471).]

670. SELBO, M. L. **Gluing of treated wood.** *Sth. Lumberm.* 182 (2280), 1951 (46, 48, 50, 52, 54). 2 refs. [U.S. Forest Products Laboratory, Madison.]

Available data on the effect of treating with oil- and water-soluble preservatives and with fire-retardant chemicals are given, and tentative recommendations made on treatment before gluing, curing temperatures, and choice of glue.

671. **Adjustable offers new style No. 2100 piling clamps.** *Wood-Worker, Indianap.* 70 (2), 1951 (72). P.R.

The Adjustable Clamp Company, 410 N. Ashland Ave., Chicago 22, Ill., has put on the market a new clamp, for which many improvements are claimed. No special starter bars, spacer bars, spacer trucks, etc. are required; all the clamping is done always centred on the pile; any reasonable thickness of stock can be glued.

825. *Cleaving. Adzing. Mechanical Comminution*

See also Nos. 727–30, 779.

672. CAMPBELL, W. B. **Mechanics of the grinding process.** *Pulp Paper Mag. Can.* 52 (3), 1951 (217–20). 1 ref.

Discusses theories on the mechanics of the process by which fibres are separated in grinding.

826. *Peeling. Slicing. Trimming and Edging of Thin Sheets*

See Nos. 690, 696–7.

829.1. *Finishing*

See also Nos. 688, 695.

673. **Staining end wood.** *Veneers & Plyw.* 45 (5), 1951 (36). P.R.

It is suggested to stain end wood (e.g. the ends of dresser tops, both the cores and veneers of which absorb stain rapidly at the ends) with a light stain before staining the whole surface, and when the ends are dry apply shellac to seal them against absorption of the darker, regular stain.

674. **Sandblasted finishing.** *Wood-Worker, Indianap.* 70 (2), 1951 (61). P.R.

Outlines the process and gives some figures regarding the air compressor, sandblast chamber, exhaust system, and safety appliances.

675. NELSON, R. N. **Portable finishing equipment.** *Wood, Chicago* 6 (2), 1951 (18–9, 37). P.R.

A report on portable sanders, presented at the recent Midwest Forest Product Research Society meeting.

676. STACEY, W. A. **Painting pressure creosoted wood.** *Wood Pres. News* 29 (5), 1951 (60–2). P.R.

If paints other than aluminium are to be employed on creosoted material of recent origin, it is advisable to paint the material first with aluminium paint. As the vehicle of the latter hardens, the aluminium flakes form a kind of metallic film that effectively seals the surface of the wood. The sealing coat should be left for several months in hot weather before applying the final paint. Direct application of paint on creosoted wood is possible when the outer surfaces have been weathered for a very long period.

83. TIMBER MANUFACTURING INDUSTRIES AND PRODUCTS. USES OF WOOD AS SUCH

831. *Fuelwood and Various Types of Rough Timber*

See also Nos. 580–1, 584, 718, 737–40.

677. KEINER, G. Die Anwendung des gemischten Holz- und Eisenausbaus in mächtigeren Flözen mit Blasversatz. [**The use of mixed wood-iron construction [in the timbering and walling of mines] in thick seams with pneumatic packing.**] *Bergbau Rundschau, Bochum* 2 (7), 1950 (288–90). [G.g.] N.C.L.

A technological and economic discussion, with diagrams and a graph, of the use of mixed wood/iron construction as compared with wood construction.

832. *Mills, Their Functions and Products*

678. BABCOCK, J. T. W. **Preventing fires in woodworking establishments.** *Wood Prod.* 56 (3), 1951 (19–22, 24).

832.1. Sawmills and Planing Mills

See also Nos. 576, 579, 654–61, 770.

679. **The British sawmilling classification of timbers 1951.** National Sawmilling Association, London. 1951. pp. 116. Price 10*s.* 6*d.* P.R.

Contains an index of trade names used commercially for timber, a botanical glossary, and a classification of timber for sawmilling, with 5 classes: (1) imported mild softwoods, (2) mild hardwoods, refractory and native softwoods, (3) medium-textured hardwoods, (4) refractory hardwoods, and (5) extra-refractory hardwoods and small log sizes on time rates.

680. KOCH, P. **The ABC's of modern planing mill layout. A problem in tooling.** *Timberman* 52 (6), 1951 (56–8, 60, 62, 64, 68, 70–1).

Three typical lay-outs and the equipment used are described.

681. **Electronic sorting.** *Wood, Chicago* 5 (11), 1950 (24, 40). P.R.

Describes a new electronic system for sorting timber according to length. Lumber from a standard line of rough mill output is placed upon a conveyor running at a speed of 150 ft./min. The detector unit is actuated by an electronic system corresponding to the duration of the break in a light beam caused by each passing board. The output of the system is about 70,000 bd. ft. a day.

832.2. VACHULA, P. Nadmiera v dl'žke piliarskej hl'adiny. [**Trimming allowance in the length of sawlogs.**] *Pol'ana* 6 (12), 1950 (265–7). [Slovak.]

Discusses, with data, the losses at present incurred through the use of incorrect, generally excessive, trimming allowance on 7- to 11-m. logs, and offers some working rules.

832.3. VUJIČIĆ, L. Koeficijenti iskorišćenja drveta u strugarama. [**Coefficients of utilization of wood in sawmills.**] *Šum. List* 74 (9/10), 1950 (360–9). 4 refs. [Serb.]

The over-all coefficient of utilization in sawing wood is equal to the product of three coefficients, viz. (1) log-quality coefficient, (2) quantitative coefficient of utilization, and (3) qualitative coefficient of utilization. The first depends upon the % of the various [Jugoslav] log classes and is fixed by the author at 1·00 for material consisting of 50% each of 1st/2nd- and 3rd-class logs. For this average material, the second coefficient is fixed at 1·00 when the quantitative utilization % is 62 (conifers), 48 (Beech), and 42 (Oak). The third coefficient for conifers, Beech, and Oak is fixed at 1·00 when the % of the 1st/2nd-class sawn timber is 75, 70 and 80 respectively, of the total out-turn. Tables for these three coefficients are given so that the standard monthly wage can be modified according to the actual performance. Various relevant data from Jugoslav and German literature are cited in support of the norms chosen.

832.4. WYLIE, A. E. **Maple dimension study.** *Wood, Chicago* 6 (5), 1951 (19, 34, 37). P.R.

Presents the results of an investigation designed to provide more accurate and complete conversion figures on rough dimensions produced from hardwood lumber by cross-cutting and ripping operations. The investigation was confined to Hard Maple of 2 grades and 4 lengths. The following conclusions were reached: (1) the decision to rip or cross-cut first depended upon the character of the product, as well as upon board width and defects in it; (2) an appreciable difference existed between yield in one fitting length and yields in a combination of appropriately chosen lengths; (3) the degree of correlation between yields according to the grading rules and yields in random or fixed-length cuttings was highly significant; (4) average length of dimension from boards cut into random or several fixed lengths was considerably increased by care in processing to secure a large % of yield in long cuttings; (5) development of statistics used in constructing charts for controlling % production of dimension from hardwood lumber by grades was a simple matter.

832.5. **Tying moldings and trim.** *Wood-Worker, Indianap.* 70 (2), 1951 (60–1). P.R.

Describes a rack for tying mouldings and trim in bundles. It has the appearance of a large trestle, each leg of which is fitted with heavy wood dowels to support the material to be tied.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-wood Assemblies

See also Nos. 579, 582–3, 635, 654, 667–71, 759.

686. MOHAMMAD, S. **A note on decorative timbers of Pakistan and economy in their use.** *Pakistan J. For.* 1 (2), 1951 (144–7).

Includes notes on the following timbers suitable for veneer: *Albizzia procera, Cedrela toona. Chikrassia tabularis, Carapa moluccensis, Calophyllum tomentosum, Dalbergia sissoo,* and *Juglans regia.*

687. WATSON, A. J., and HIGGINS, H. G. **Suitability of Australian timbers for veneer.** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 260, 1950. pp. 23. 13 refs.

Data are given on the distribution, size, supply, density, and susceptibility to *Lyctus* of about 50 species, with tabulated results of peeling tests.

688. CONNELLY, H. H. **Veneer cutting affects finishing.** *Veneers & Plyw.* 45 (2), 1951 (40–1). P.R.

689. PERRY, T. D. **Matching veneers.** *Wood Prod.* 56 (3), 1951 (30–5).

690. SACHT, H.-J. Moderne Maschinen für die Furnierherstellung. [**Modern veneer-making machines.**] *Holz Roh- u. Werkstoff* 9 (1), 1951 (20–6). [G.g.] P.R.

A condensed survey, with descriptions of the characteristic features and properties of modern machines: slicers, peelers, clippers and spooling machines. The outputs required by the veneer industry place the construction of these machines on the same level as the construction of tools for metal working. *From author's summary.*

691. **Plywood production in Japan.** *Wood* 16 (3), 1951 (86–9).

692. WAKITA, M. **An attempt to use blood of live-stock as an adhesive for plywood.** *Wood Res., Kyoto* No. 4, 1950 (45–9). [Jap.e.]

An adhesive with a longer life and greater strength for cold-press gluing was obtained by adding 'viscosified' sawdust and slaked lime to the blood of domestic animals. *From author's summary.*

693. MACDONALD, M. D. **Compression of Douglas Fir veneer during pressing.** *Timberman* 52 (4; 5), 1951 (98–100, 102; 86, 88, 90, 92). 8 refs. [Oregon Forest Products Laboratory, Corvallis, Oregon.]

An investigation was made into the main factors affecting compression and a new method of controlling the amount of compression for given combinations of pressure, temperature, and time. Figures showing the direct relationship of compression to temperature and to pressure are given in graphs. The moisture content of the assembly is also in direct relationship to the amount of compression, and where a choice of adhesive exists, one with a lower moisture content should be used. The effect of time on compression is related to the spread of

heat through the assembly, and the maximum compression for a given combination of pressure and temperature will occur when the temperature throughout the thickness of the assembly has been equalized; in tests (results of which are given in graphs) the maximum compression of a 3-ply ⅜ in. assembly was approached at the end of 10 minutes, but compression continued to increase very slowly during the rest of the 20-minute test period. Surface characteristics of the veneers are important; veneers with absolutely smooth faces could be pressed at 25 lb./sq. in. and loss of wood would be negligible. Figures for recovery after conditioning (tabulated) show that recovery increases with the equilibrium moisture content to which the assembly is conditioned. Figures showing the relationship between shear strength and varying temperatures and pressure are tabulated. A method of controlling compression is described, in which the amount of compression needed to smooth out irregularities in thickness and to bring the adjoining plies into full surface contact is roughly calculated: a limit-control mechanism is set so that closure of the platens stops automatically when compression has reached the point required. Strength values for panels pressed to 3, 5 and 7% compression and those pressed without the control mechanism are tabulated.

694. **Cauls have many uses at plywood presses.** *Veneers & Plyw.* 45 (5), 1951 (38–9).

Aluminium has many advantages as a material for cauls (separators) used in plywood presses for preventing the panels from being bonded together and for protecting the fine veneers from contamination with rust and other foreign matter. In cold presses the insertion of paper between adjacent pieces of work is very often sufficient. Cauls can usually be dispensed with when stock panels with relatively heavy face veneers are being processed in a hot-plate press, since they can be sanded later to bring the faces into proper condition. Specially designed caul racks are very useful for quick handling. It is suggested that thin sheets of stainless steel, handled magnetically, could be used with advantage as cauls.

695. **Plywood production tips.** *Wood, Chicago* 6 (4), 1951 (25, 47). P.R.

Notes on modifications in apparatus and method in a typical Northwest plywood mill utilizing the smaller-sized and more defective Douglas Fir of the present day, e.g. cross-circulating driers, patching equipment.

696. ARNESON, G. N. **New developments in plywood manufacturing equipment.** *Lumberm.* 78 (3), 1951 (71–2, 74). 4 photos.

Discusses the use of electric lathe drives, the scraper-type barker, veneer driers, gluing equipment, panel patching equipment, and the hydraulic scissors lift, in the plywood industry.

697. HYLER, J. E. **Plywood stockpile methods affect finished product.** *Veneers & Plyw.* 45 (4), 1951 (38–41). P.R.

Practical hints for determining the number of panels in a pile at a glance, and for making a heavy plywood cover with a counterweight. Also describes saw blades for cutting plywood, and the moulding and surfacing cutters used on plywood edges.

698. TANIMURA, T., NAGATA, J., and OKAMOTO, K. **Research about cracks of plywood and penetrate conditions of glue substances.** *Bulletin of the College of Agriculture, Utsunomiya University, Japan* 1 (1), 1950 (65–79). [E.jap.] C.G.B.

Gives the results of microscopic investigation (magnification 20–100 ×) on 15-μ cross-cut microtome sections of 3-ply specimens taken from 5 plywood types made from rotary veneers, each type tested in two positions differing by 90°. Cracking occurs, in general, on the slack side of the veneer sheets; cracks are more frequent in ring-porous wood (*Kalopanax pictus* and *Quercus crispula*), less so in diffuse-porous wood with medium vessels (*Betula nikoensis*), and rarest in diffuse-porous wood with small vessels (*Tilia japonica* and *Fagus crenata*); cracks are large and numerous when the angle between the annual ring and the glue-line is large; size of cracks decreases in the sequence: *Fagus, Tilia, Quercus, Kalopanax* and *Betula*. Some figures are given on the penetration of glue into cracks and vessels.

699. BROWN, T. A. **The manufacture of wooden details by split-block construction.** *Wood* 16 (3), 1951 (92–3).

The construction of wooden wing ribs for sailplanes and gliders has been simplified by building up a block from short lengths glued with resin glues and slicing it by circular saw into a number of parts of the same thickness. The method has also been successfully applied to box-section spars, to details which must be identical in profile and which are spindled before slicing, and to other parts.

700. **Laminated fire-escapes.** *Wood* 16 (4), 1951 (146–7).

Since the war, wheeled fire-escapes to new specifications for rigidity have been made in Great Britain from laminated wood. The stringers for the ladder, 25 ft. in length, are made up of laminated booms rebated for skins and grooved on the inside for spacers. The booms consist of 4 laminations of Ash, each of which is previously scarf-jointed. Blocks in multiples of the boom width are glued up with the scarfs staggered. The blocks are ripped into individual booms and machined to finished size. Spacers and blocks are laminated in 3 layers to reduce movement from changes in moisture content. The skins are made in multiple widths of specially made, slightly compressed, Birch plywood, and are scarfed up to length before ripping to finished width. The laminated stringers are finally fitted with Oak rungs.

701. GLASS, J. B. **Modern design in timber and its usage at the festival of Britain.** *Emp. For. Rev.* 30 (1), 1951 (22–4 — 8 photos).

Deals particularly with the use of laminated beams and arches, and plywood construction.

833. *Timber in Buildings and Engineering Structures (Manufacture and Use)*

702. DUNLAP, M. E. **Condensation control in frame buildings.** *B.C. Lumberm.* 35 (2), 1951 (49–50, 96, 98). 13 refs.

Discusses the causes and effects of condensation, and control methods, including the installation of vapour barriers and ventilators.

833.1. Building Components and Fittings: General

See also Nos. 592, 637, 701.

703. HECK, G. E. **Comparative tests of nailed built-up beams of various constructions.** U.S. Forest Products Laboratory, Madison. 1950. pp. 1. P.R.

Describes a series of tests demonstrating the weakening influence of other than full-size continuous laminations in built-up beams, where design is based on full-size members.

704. **Wood casement windows.** *Wood* 16 (5), 1951 (194–5).

Discusses the revised edition of *Brit. Stand.* No. 644, Part I.

705. SHAW, J. **Parquetry flooring has been greatly simplified.** *Veneers & Plyw.* 45 (5), 1951 (34–6). P.R.

Describes a new technique of parquet flooring, using prefabricated glued-up units (12-in. to 20-in. square) of the desired pattern.

833.8. Wood in Hydraulic, River and Marine Uses

706. SUSMEL, L. **Le condotte in legno. [Wooden pipes.]** *Ital. for. mont.* 6 (1), 1951 (19–36). 12 refs. [It.f.e.]

Discusses the advantages and disadvantages of wooden pipes for carrying water and other liquids with a more acid or more alkaline reaction; relative durability of different species; and methods of construction.

834. *Shingles. Cooperage. Packing Containers*

See also No. 706.

707. **[Suitability of Indian timbers for whisky kegs.]** *For. Res. India Burma 1947–8*, 1950 (56).

Tests on a dozen Indian timbers to find a substitute for imported Oak for the manufacture of kegs for maturing whisky, showed that *Terminalia tomentosa* heartwood was the best, followed by *Shorea robusta*. The rest—*Tectona grandis, Ougeinia dalbergioides, Artocarpus hirsutus, Grewia tiliaefolia, Anogeissus latifolia, Acacia arabica, Lagerstroemia lanceolata, L. flos-reginae, Quercus dilatata*, and *Q. semecarpifolia*, imparted a bitter taste and dark colour to the whisky. Further tests were made by emptying out the contents and re-filling the kegs with fresh whisky. It was found after a few months that all the timbers gave good results except *T. grandis* and *O. dalbergioides*, which imparted a peculiar smell.

708. **Wooden containers. British Standard Packaging Code.** *Brit. Stand.* No. 1133 (Sect. 8), 1950. pp. 138. P.R.

709. ROYCE, C. K. **Military requirements for wood in packaging.** *B.C. Lumberm.* 35 (5), 1951 (68, 70). [Department of Navy, Washington, D.C.]

Lists acceptable species, grouped according to their properties, and discusses generally requirements for moisture content and timber quality. [Cf. *For. Abstr.* 12 (No. 2214).]

710. **Supreme announces box machine.** *Wood-Worker, Indianap.* 78 (2), 1951 (73). P.R.

The Supreme Woodworking Machinery Co., 50–52 Howard St., New York 13, announce the Danckaert Lock Corner Box Machine, designed for making a complete mineral-water box.

835. *Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Uses etc.*

711. JOPSON, H. E. **Advantages of working to gauges in machining small wood parts.** *Wood Prod.* 56 (2), 1951 (18–20).

Discusses the use of metal gauges and templates for maintaining accuracy in manufacturing piano parts.

712. **Wood best for artificial limbs.** *Wood-Worker, Indianap.* 70 (1), 1951 (27). P.R.

Contains general information on the use of wood for artificial limbs. English Red Willow [*S. alba* var. *caerulea*?] is the preferred wood, but other kinds of upland Willows are also used, and so are Hard Maple, Birch, Ash, and Yellow Poplar.

836. *Furniture and Cabinet-making. Carving. Marquetry. Wooden Ornaments*

713. ***Technical Bulletin, Furniture Development Council.*** The Furniture Development Council, 11 Adelphi Terrace, Robert Street, London, W.C.2. 2-monthly. Price to contributing bodies 15*s.* p.a., to others 30*s.* p.a. P.R.

Vol. 1, No. 1, for Jan./Feb., 1951, contains some 20 pages. The Council's aim is to collect and circulate to the furniture industry all current technical and scientific information affecting furniture manufacture. The bulletins will contain 4 regular features: selected items of interest to one section of the industry; technical notes; summaries of published articles and books; and questions and answers. Abbreviation in *For. Abstr.: Tech. Bull. Furniture Developm. Coun.*

714. **School furniture.** *Brit. Stand.* No. *BS/MOE* 11–22, 1950. pp. 114. Price 17*s.* 6*d.* P.R.

839.8. *Industrial Waste Wood and its Uses*

See also Nos. 576, 692, 780, 782, 786, 793.

715. **Waste runs high.** *Wood-Worker, Indianap.* 70 (2), 1951 (41). P.R.

Figures collected by an advertising department show that in cutting up a tree for cooperage 72% is wasted; for lumber, 68%; while for other specialized productions it may run as high as 80%. In 1944, an average year, logging waste in the U.S.A. amounted to 49 million tons, of which 7% was used as fuel. Primary manufacturing of wood into lumber, wood pulp etc. caused a waste of 52·9 million tons, of which 60% was burnt as fuel. Secondary manufacture of furniture, flooring millwork, etc., wasted 7 million tons, nearly all of which went as fuel.

716. GUERNSEY, F. W. **Wood waste in the Douglas Fir region.** *Paper Tr. J.* 132 (19), 1951 (23–4, 26, 28). 11 refs. P.R.

Studies conducted during and since the war show the % of recoverable waste from logging to vary between 19·0 and 25·0% of the original volume, the small material being removed by 3 methods: pre-logging, clean logging, and re-logging. The waste was utilized mainly for pulpwood, yielding a somewhat inferior pulp, but some was converted to lumber (mainly Nos. 1–3 Grade Common Lumber). Sawmill waste amounted to *ca.* 33% of the cubic volume converted, and consisted of nearly equal amounts of sawdust and solid waste (slabs, edgings and trim). Sawdust and shavings were used almost exclusively for fuel. Utilization of Hemlock (and Cedar) sawdust and small solid waste presents the greatest difficulties because of the high moisture content of green wood.

717. ŠTAJDUHAR, F. Briketiranje piljevine. **[Briquetting of sawdust.]** *Šum. List* 74 (7/8), 1950 (288–96). 2 refs. [Croat.]

Describes briquetting tests carried out in 1949 in the Industrial Forest Enterprise at Belišče. The pressures used were 1,500–2,500 atm.; the temperature, 25–50° C.; and the binder (not always used), wood tar. The tests were done with sawdust from steamed Beech wood, Spruce, Pine, and Fir. The results show that (1) a pressure of 1,500–2,000 kg./sq. cm. is sufficient, (2) the quantity of binder required is 6% by weight (Pine sawdust can be briquetted without any binder), (3) moisture content of sawdust should be within the range 10–15%, (4) the best temperature is *ca.* 40° C. The Swiss high-pressure universal briquetting machine 'Glomera' is described and illustrated. [Cf. *For. Abstr.* 9 (No. 988).]

718. NIKANDER, B., and TAMMINEN, V. **The use of wood as fuel for industrial purposes and railway engines in Finland.** *Paper, Fourth World Power Conference, London* No. 1, Sect. *E*4, 1950. pp. 10 + 1 dgm. D.S.I.R.

Methods of burning wood logs and wood refuse, and some special furnaces developed for this purpose, are described. The maximum steam production obtainable with wood fuels is usually *ca.* 1 ton of steam per 1 sq. m. grate area. The use of wood fuel in locomotives and some constructional details of engines using wood fuel are described. [Cf. *For. Abstr.* 13 (Nos. 580, 791).] *From authors' summary.*

719. GRANUM, H. Sagflis og kutterflis som isolationsmateriale i hus. **[Sawdust and shavings for insulating buildings.]** *Norsk Skogind.* 5 (2), 1951 (55–9). [Nor.e.] P.R.

Sawdust and shavings have been successfully used in Sweden and Finland and in some country districts in Norway. Figures are quoted to show their valuable insulation qualities. Experience shows that they are no more liable to rot than solid wood, and there is no evidence that their use encourages rats and mice, or that they increase the danger of fire in wooden houses. If present restrictions on their use as insulating material in towns and suburbs in Norway were lifted, it is estimated that an annual saving of 7–8 million *Kr.* might be effected. Constructional designs are given to illustrate the use of sawdust and shavings in wall, floor and ceiling spaces.

720. SHUTAK, V. G., and CHRISTOPHER, E. P. **Mulch for berries.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (65–79). 7 refs. P.R.

Presents results of experimental cultivation of blueberries (clean cultivation with or without cover crop; straw mulch; sawdust mulch). Berries from sawdust-mulched plots were among the largest. A slight delay was observed in the ripening of berries from sawdust-mulched plots. Soil moisture was usually highest under the sawdust mulch. Under sawdust, bushes developed numerous fibrous roots which were often partially or totally in the sawdust. The sawdust-mulched bushes were by far the heaviest. Hardwood sawdust appears to increase, and softwood sawdust to decrease the pH of the naturally acid soil.

721. LUNT, H. A. **Wood chips as a soil amendment.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (83–9). P.R.

Gives preliminary results of the studies in progress: (1) none of the wood chips used increased the acidity of the soil; (2) first crop yields following the application of chips were markedly reduced as a result of N starvation; (3) Aspen/Grey Birch chips decomposed the most rapidly, and Pine chips the least rapidly; (4) bulk density of the soil was reduced, and its water-holding capacity was increased in proportion to the rate of chip application. *From author's summary.*

722. MCINTYRE, A. C. **Wood chips and farming.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (7–13). 27 refs. P.R.

General account of use of wood chips for mulching, soil amending, road banks and grounds, and as bedding and litter.

723. HENDERSON, B. W. **Wood chips as a bedding material for dairy cows.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (95–6). P.R.

724. PULVER, W. **Wood chips as bedding.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (97–100). P.R.

725. RATLIFF, F. T. **Wood chips for use in roofing felt manufacture.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (117–9). P.R.

726. KOROLEFF, A. **Possibilities of wood chipping in forest management.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (15–8). P.R.

Discusses the following uses of wood chippers: (1) deliberate chipping as in chemical pulp production, (2) chipping for the purpose of disposing of wood that is nuisance material, (3) converting valueless wood into chips to permits its remunerative utilization.

727. MORGAN, J. T. **Stationary chippers for processing low-quality and waste wood.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (19–26). 7 refs. P.R.

728. FOBES, E. W. **Portable wood-chipping equipment.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (27–40). P.R.

729. FENTON, R. H. **A pilot study of the use of light portable wood chippers.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 33, 1951 (41–7). P.R.

730. **Portable chippers—data on the utilization of sawmill reject material and initial trials of the Carthage portable chipper.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1138 (*B*–11), 1951. pp. 12 +6 photos, 3 dgms.

The Carthage portable chipper, an experimental model of a disc type designed to produce chips from slab wood and small round wood by the Carthage Machine Co., Carthage, N.Y., is described with illustrations. Results of field tests in the U.S.A. showed a satisfactory production rate and it seems possible that an output of 40 round-wood cords per 8-hour day could be reached. Tabulated figures are given showing estimated costs at productions of 1·5 and 3·5 cords per hour, to be $5·374 and $2·358 per round-wood cord equivalent respectively. Different methods of removing bark, either by barking the logs or slabs or by screening, are discussed. Tabulated figures are given showing the content of bark in sample railway loads and in sample cords at the mill. The costs of transporting chipped material by rail and road are considered.

84. PRESERVATION AND OTHER TREATMENTS TO IMPROVE THE PROPERTIES OF WOOD. DAMAGE BY BIOLOGICAL AGENCIES AND ITS CONTROL. SEASONING. TIMBERYARD PRACTICE

841. *Wood Preservation*

731. SHIPLEY, G. B. **The wood-preservers' contribution to conservation.** *Wood Pres. News* 29 (3), 1951 (35–9, 43). P.R.

A short economic survey of the importance of wood-preserving. Contains, among others, a table showing the quantities (in cu. ft.) of various kinds of wood treated in the U.S.A. (in 1929, in 1949, and during the period 1909–49); and another showing the quantities of wood treated with various kinds of preservatives. The % figure for creosote and creosote mixtures rose from 91·16 in 1929 to 94·35% in 1949. $ZnCl_2$ accounted in 1929 for 7·61% of wood; it is not used now, but chromated $ZnCl_2$ accounted in 1949 for 1·30%.

732. PEREIRA, J. ARANHA. **Usinas de tratamento de madeiras—sua influência na nossa economia florestal. Elementos básicos para a sua organização. [Wood-preserving plants—their influence on Brazilian forest economy. Basic principles of their organization.]** *Separata, Instituto de Pesquisas Tecnológicas de São Paulo* No. 236, 1950. pp. 8. [Port.] *Separate* from *Engenharia, São Paulo* 8 (89), 1950. P.R.

733. **Treated lumber in building maintenance and construction.** *Wood Pres. News* 29 (2), 1951 (18–9, 29). P.R.

A committee report presented at the 1950 Convention of the American Railway Bridge and Building Association. Discusses briefly the handling and storage of treated Southern Pine, Douglas Fir and Black Gum, and types of treatment, and presents a table of values for strength in bending of untreated and salt-treated specimens of Douglas Fir.

734. SCHOFIELD, J. A. **Coal tar creosote as a wood preservative.** *Timber News* 59 (2140), 1951 (53–4). (*Monthly Bulletin of the British Wood Preserving Association*).

735. HARROW, K. M. **Preservative treatment of Rimu and Matai sapwood by pressure impregnation.** *N.Z. J. Sci. Technol.* 31*B* (4), 1950 (15–20). 3 refs. P.R.

The results of pressure treatments of Rimu (*Dacrydium cupressinum*) and Matai (*Podocarpus spicatus*) sapwood with aqueous solutions show that the gross absorption percentages obtained under identical conditions of pressure are similar. Absorption of cold solutions, particularly into Rimu, was very slow, but the rate increased with temperature of the solution. High negative correlation coefficients were found between net absorption and timber density. Net absorption decreased with rise in initial air pressure, but increased with rise in temperature. *From author's summary.*

736. WALTERS, C. S. **Experimental treating plant built at Dixon Springs.** *For. Note Ill. agric. Exp. Sta.* No. 23, 1951. pp. 2 + 3 dgms.

Specifications, incorporating improvements (including a horizontal treating tank) for a treating plant originally designed at Sinnissappi Forest [Cf. *For. Abstr.* 8 (No. 1256)].

737. KLEISER, E. **Tiefimprägnierung von Fichtenmasten mit Quecksilbersublimat. [Deep impregnation of Spruce poles with mercuric chloride.]** *Elektrizitätswirtschaft, Göttingen* 49 (8), 1950 (237–9). 2 refs. [G.] D.S.I.R.

Describes the 'dia-Kyanization' method of impregnating poles with $HgCl_2$, after pre-treatment with wet and dry heat. The poles are first steamed, then subjected to a short artificial drying process, and dipped, while warm, into a cold bath of $HgCl_2$ solution. This results in a penetration of the preservative several times deeper, than in the absence of the pre-treatment, and in the filling of cracks with $HgCl_2$.

738. WALTERS, C. S., KULP, D. A., and FOX, H. W. **Treatment of hardwood fence posts by brushing with Osmosar preservative.** *For. Note Ill. agric. Exp. Sta.* No. 22, 1951. pp. 2 + 2 photos, 1 tbl.

739. WALTERS, C. S., and KULP, D. A. **Report on project 301-C. Preservative treatment of fence posts with toxic oil solutions by cold-soaking, dipping and brushing.** *For. Note Ill. agric. Exp. Sta.* No. 21, 1951. pp. 2 + 2 tbls.

740. WALTERS, C. S., and KULP, D. A. **Report on Project 301–A. Preservative treatment of fence posts by cold-soaking in pentachlorophenol/fuel-oil solutions.** *For. Note Ill. agric. Exp. Sta.* No. 20, 1951. pp. 2 + 2 tbls.

741. BAVENDAMM, W. **Die Beurteilung der toxischen Wirkung der Holzschutzmittel. [Evaluation of the toxic effect of wood preservatives.]** *Holz Roh- u. Werkstoff* 9 (3), 1951 (101–5). 11 refs. [G.g.] P.R.

A review of existing methods. The usual method based on the threshold value of the preservative being unsatisfactory, acceptance is suggested of

a slightly modified method of Schulze-Theden-Starfinger based on the threshold value of the preserving solution. *From author's summary.*

742. AMBLER, H. R., and MCCREA, G. W. **The behaviour of treated wood on exposure in tropical jungle.** *Report, Ministry of Supply Tropical Testing Establishment, Nigeria* No. 35, 1950. pp. 15 + 6 photos. P.R.

Specimens prepared from heartwood and sapwood of British-grown Scots Pine, treated with one of five preservatives by dipping at atmospheric pressure, and then either painted or unpainted, were tested for fungus and termite attack in jungle conditions. Coal-tar creosote and 25% Cu naphthenate solution in petroleum distillate prevented extensive fungal decay, although they did not prevent surface mould. The best protection against termite attack was afforded by the Cu naphthenate, especially if followed by painting. A dipping time of 2 min. appears necessary and adequate.

844. *Attack by Plant Organisms*

844.2. Wood-destroying Fungi

See also Nos. 58, 632.

743. PINTO-LOPES, J. Poliporoses e fungos da decomposição da madeira em Portugal. [**Polyporaceae and wood-rotting fungi in Portugal.**] *Separate* from *Revista da Faculdade de Ciências de Lisboa* (*Ser. 2*) 1*C*, 1950 (53–108). 40 refs. [Port. port.e.g.] P.R.

Describes (1) the most important Portuguese Polyporaceae and the type of damage caused in living trees, and (2) the most important wood-rotting fungi of Portugal.

744. WRIGHT, J. E. Identificación por cultivo 'in vitro' de los hongos destructores de madera. [**Identification of wood-destroying fungi by cultivation *in vitro*.**] *Idia* 3 (32), 1950 (17–8). [Span.] C.G.B.

An outline of the methods used at the Instituto de Sanidad Vegetal, Buenos Aires.

745. GRIFFIOEN, K. **Some wood-destroying fungi of Indonesia.** *Tectona* 39 (4), 1949 (348–67). [E.]

Laboratory tests of a number of fungi showed that two of the most dangerous were *Polystictus hirsutus* and *P. sanguineus*, which both tolerate a wide range of moisture content in wood. *Lentinus sajor-caju* was found to be very virulent, to fructify easily, but to need a rather high moisture content. *Polyporus cervino-gilvus* is classed as a moderate wood destroyer. *Guepinia spathularia* combines moderate decay with severe discoloration.

746. OHSAWA, M., and ABE, Y. **Decay of Beechwood in Hokkaido.** *Res. Bull. exp. For. Hokkaido Univ.* 14 (2), 1949 (186–207). 29 refs. [Jap.jap.e.]

Experiments on *Polystictus hirsutus*, *Schizophyllum commune*, and *Polystictus versicolor* showed that:— (1) the optimum temperature for growth on malt agar was *ca.* 29° C., while the upper limit for mycelial growth appeared to lie a little above 38°; (2) Japanese soy with onion, and malt agar, were the best of the 8 culture media used; (3) mycelium grown on a liquid malt medium died in a water bath controlled at 75° for 5 min. though not at 55° after 120 min.; (4) all 3 fungi are to be classed as lignin-destroying. *P. hirsutus* appears to need a wood moisture content of at least 80%, while *S. commune* appears to grow almost as well at moisture contents of 15 and of 40%. Beech [*Fagus crenata*] showed greatest loss of weight with *P. hirsutus* (20% after 2 and 50% after 4 months), followed by *Stereum purpureum* (13·4 and 34·1%), *P. versicolor* (10 and 32·5%) and *S. commune* (0·9% after 4 months). *From authors' summary.*

747. DEBAUN, R. M., KUDZIN, S. F., and SCHUBERT, W. J. **On the mechanism of enzyme action. XLI. A role of α-ketoglutaric acid in the carbohydrate metabolism of wood-destroying molds.** *Arch. Biochem.* 26 (3), 1950 (375–81). 15 refs. O.R.S.

748. MORGAN, E. N. **Metabolic products of the wood-rotting fungus *Polyporus benzoinus* (Wahl.) Fr.** *Biochem. J.* 48 (3), 1951 (xliii–xliv.). 2 refs. [London School of Hygiene and Tropical Medicine.] O.R.S.

749. BAGCHEE, K., and BAKSHI, B. K. ***Poria monticola* Murr. on Chir (*Pinus longifolia* Roxb.) in India.** *Nature* 187 (4255), 1951 (824). 2 refs.

P. monticola was isolated from Chir sleepers in circumstances suggesting that it occurs naturally in India, and that it can be traced back to the felling coupes of Chir in the Himalayas. Sleepers were rejected when the rot penetrated to the core. Those with superficial rot in the incipient stages were sterilized in steam under pressure and stacked in the open under cover; they are so far [after about a year] in good condition.

844.3. Other Plants

750. EADES, H. W. **Removal of moss from a shingled roof.** *B.C. Lumberm.* 35 (3), 1951 (98).

If removed mechanically by sweeping with a stiff broom or wire brush, the moss will usually soon reappear. Chemical treatment generally gives longer though still not permanent control. In dry weather, the roof can be sprayed with 10% $ZnCl_2$. Alternatively the roof can be washed or sprayed with a solution of Na arsenite, *ca.* 1 gal. 33% Na arsenite to 37 gal. water. Both chemicals are poisonous and if the solution runs either directly or via a septic tank into the soil, no crops will grow for some time on the area affected. In a method used successfully in country districts, an extra ridge cap of zinc is nailed along the whole length of the roof. As a result of a slight reaction between rainwater and the metal, a dilute chemical solution is carried down the roof and retards the growth of moss.

845. *Attack by Animals*

845.2. Terrestrial Borers

751. SPILLER, D. **The biology and control of beetles attacking seasoned timber.** *Repr.* from *Tuatara* 3 (1), 1950 (12–9).

A short review based on work done by the Plant Diseases Division of the New Zealand Department of Scientific and Industrial Research.

752. VRYDAGH, J.-M. Faune entomologique des bois au Congo belge: les insectes bostrychides. **[The insect fauna of Belgian Congo timbers: Bostrychidae and Lyctidae.]** *Bull. agric. Congo belge* 42 (1), 1951 (64–90). 13 refs. [F.flem.]

753. DUVAL, G. Contrôle da broca do bambu com soluções oleosas de inseticidas clorados. **[Control of the Bamboo powder-post beetle with oil solutions of chlorinated insecticidal preparations.]** *Biológico* 16 (8), 1950 (159–62). [Port.] C.G.B.

Four types of insecticide dissolved in diesel oil were tested on Bamboo culms at the Mato Dentro Station of the Instituto Biológico to estimate their value in protecting the culms against *Dinoderus minutus*. The green culms were painted with the preparations shortly after being cut. DDT (5–10%) gave complete immunity. The γ-BHC was satisfactory at all concentrations between 0·75 and 3%. With Chlordane and Toxaphene some boring took place at first but the borers were finally killed. Diesel oil alone proved valueless.

754. PLANK, H. K., and HAGEMAN, R. H. **Starch and other carbohydrates in relation to powder-post beetle infestation in freshly harvested Bamboo.** *J. econ. Ent.* 44 (1), 1951 (73–5). 2 refs. [Federal Experiment Station, Mayaguez, Puerto Rico.]

Internodes were cut from the base, middle and top of culms from 5 species of Bamboo. From these internodes test rings were taken, and sample rings from each were tested by the iodine-spot method. The remaining rings were then documented according to the iodine-starch score of the internode from which they were taken, and divided into two groups, one of which was analysed for carbohydrate content, and the other exposed to infection by *Dinoderus minutus*. The results were then correlated with the spot-test scores. Severity of attack by adult *D. minutus* was governed by the amount of starch present, and, within certain limits, reaction to the iodine-spot method was a reliable indication of starch concentration and of the intensity of subsequent infestation. [Cf. *For. Abstr.* 12 (No. 575).]

755. **[Borers of Sal ballies and of *Boswellia serrata*.]** *For. Res. India Burma 1947–8*, 1950 (35–6).

Shorea robusta ballies (poles 2 ft. in girth) felled in April or July, kept flat, raised on skids, out in the open, and barked after 3 months, remained practically immune to powder-post beetle attack, and no serious damage was done by any other borer. If barked within 2 months after felling they are attacked by powder-post beetle; and if kept in the open with bark intact for more than 3 months, they are liable to serious damage by Cerambycidae, Curculionidae and other borers. Ballies kept in the shade, whether barked or not, were severely attacked.

Ballies felled in October after the rains, barked immediately and kept in the forest shade were immune to borer attack; those kept in the open and barked after 2 months were also immune.

Ballies felled in December, kept in the forest shade and barked any time up to 5 months after felling, were heavily attacked by powder-post beetle, and when barking was delayed beyond 6 months, were made useless by longicorn beetles. If kept in the open and barked after 5 months they were immune to powder-post beetle attack; if barked within 4 months of felling, however, they were heavily attacked.

Planks obtained from logs of *B. serrata* felled during the monsoon (August) remained free from powder-post beetle attack; those from spring, summer, and winter fellings were heavily attacked, especially by *Sinoxylon anale*. The explanation may be that natural depletion of starch and sugars takes place much quicker in the monsoon than at other seasons.

845.3. Termites

756. KEMP, P. B. **The susceptibility of wood to termite attack.** *E. Afr. agric. J.* 16 (3), 1951 (122–3). 3 refs.

Tests were made of 30 Tanganyika species by burying specimens of green wood on 20 different sites, with the following results:—Readily attacked: *Sterculia africana, Commiphora fischeri, C. ugogensis, C. schimperi, Lannea humilis* and *Royena fischeri*. Moderately attacked: *Strophanthus eminii, Hymenodictyon parvifolium, Combretum zeyheri, Markhamia obtusifolia, M. acuminata, Combretum gueinzii, C. obovatum, Schrebera koiloneura, Cassia singueana, Dalbergia stuhlmanii, Ziziphus mucronata, Teclea glomerata, Grewia platyclada, G. bicolor, Acacia drepanolobium, Fagara merkeri, Ostryoderris stuhlmanii*, and *Dalbergia melanoxylon*. Almost unattacked: *Ormocarpum trichocarpum, Strychnos heterodoxa, Dichrostachys glomerata, Acacia rovumae* and *Abrus schimperi*. *S. heterodoxa* appears to lose its immunity with time.

757. MACGREGOR, W. D. **The protection of buildings and timber against termites.** *Bull. For. Prod. Res., Lond.* No. 24, 1950. pp. v + 41 + 8 photos, 1 set of drawings. 21 refs. Price 1*s.* 9*d.*

Discusses: the life history and habits of earth- and wood-dwelling termites; general protective measures, including education and demonstration, and legislation; the eradication of termites from building sites, buildings, and infested wood; the use of resistant or treated timber, with methods of preservation, and types of preservative; methods of construction to prevent infestation. Appendices list indigenous timbers of British East and West Africa, British West Indies, Fiji, Malaya, North Borneo and Sarawak, reputed to be resistant to attack, and give information on collecting and despatching termites for identification.

758. ISHERWOOD, H. R. **Life artery of a building —or how termites set up housekeeping.** *Pest Control* 19 (3), 1951 (22–3). D.S.I.R.

Illustrated explanation of the general points of entry of the subterranean termite to the vital parts of a house, and of the damage done.

847. *Drying* (*Seasoning*)

See also Nos. 576, 695–6, 755.

759. SELJUGIN, N. S. Suška drevesiny. **[The drying of wood.]** Goslesbumizdat, Moscow and Leningrad. 3rd. ed. (rev.) 1949. pp. 535 + 1 photo + 3 dgms. + 4 nomograms. Numerous refs. [Russ.] Revised by P. S. Sergovskiĭ and edited by N. N. Čulickiĭ. Price *Roubles* 19.55.

A university textbook, the preceding edition of which was published in 1940, with the following chapters:—(1) Properties of moist air and flue gases (pp. 20–48). (2) Moisture in wood (pp. 49–67). (3) Physical bases of the theory of wood drying (pp. 68–111). (4) Kiln types and systems (pp. 112–54). (5) Individual components of kilns (pp. 155–98). (6) Transport of material: piling equipment for making up and removing the kiln charge (pp. 199–223). (7) Constructional design of kilns and planning of the lay-out of kilns and accessory installations (pp. 224–32). (8) Apparatus for measurement and automatic regulation of temperature and humidity (pp. 233–60). (9) Kiln-drying practice (pp. 261–316). (10) Air drying (pp. 317–42). (11) Labour and staff problems; organization of work (pp. 343–61). (12) Testing of kilns; factors for assessing technical and economic efficiency (pp. 362–87). (13) Drying of veneer and plywood (pp. 388–424). (14) Special methods of drying; methods for particular products (e.g. matches, sawdust, fuel for gas-producers) (pp. 425–67). (15) Planning of kiln-drying establishments; specifications and calculations involved (pp. 468–521).

There are numerous graphs and line drawings throughout, references to literature at the end of each chapter, and a brief subject index.

760. **[Air seasoning of *Anogeissus latifolia* and *Cynometra polyandra*.]** *For. Res. India Burma 1947–8*, 1950 (55).

Seasoning tests were made on 2-in. planks of these two very refractory woods. Timber was stacked for seasoning in March, May, July and December. That stacked in March and May dried very quickly but developed deep cracks in almost all planks; that stacked in December was only slightly better, but planks stacked in July dried slowly and only 20% suffered from cracking or splitting. The results show that these woods can be satisfactorily seasoned if they are converted in the rainy season and immediately stacked for air drying in sheds.

761. **[The effect of girdling on the seasoning of *Pterocarpus marsupium*.]** *For. Res. India Burma 1947–8*, 1950 (55).

Girdling of trees of *P. marsupium* had no appreciable effect on air-seasoning qualities. Planks 1½-in. thick, from girdled and from ungirdled trees, took about 6 months to dry. The timber, though refractory, can be satisfactorily seasoned if given protection from sun and hot winds.

762. **The seasoning properties of exotic timbers.** *Leafl. For. Prod. Res., Lond.* No. 44 (Suppl. No. 2), 1950. pp. 4.

Kiln schedules are suggested and details of shrinkage and movement during drying are given for each of the following species: Greenheart (*Ocotea rodiaei*), Krabak (*Anisoptera* sp.), Mchenga (*Isoberlinia globiflora*), Morabukea (*Mora gonggrijpii*), Mtonda (*Brachystegia spiciformis* (?)), Nyankom (*Tarrietia utilis*), Rhodesian Teak (*Baikiaea plurijuga*), and Utile (*Entandrophragma utile*).

763. GRATZL, A. Der Weg zur Hochtemperaturtrocknung. **[High-temperature seasoning.]** *Repr.* from *Internationaler Holzmarkt, Wien* No. 1, 1951 (1–6). 10 refs. [G.] P.R.

Discusses the principles of air and kiln seasoning, emphasis being laid on the high-temperature seasoning (110–115–120° C.), adopted by a number of German timber firms. The considerable saving of time and energy (heat) is analysed, and the construction, operation, and characteristic features of high-temperature kilns are outlined. High-temperature-seasoned timber differs in many respects from timber seasoned by other methods. It is claimed to be more plastic, with a smaller E modulus. Some timbers (e.g. Oak) are not suited to this method.

764. EGNER, K. Zur Trocknung von Hölzern bei Temperaturen über 100° C. **[Drying of wood at temperatures above 100° C.]** *Holz Roh- u. Werkstoff* 9 (3), 1951 (84–97). 7 refs. [G.g.] P.R.

An illustrated description of an investigation on high-temperature seasoning (100–110° C.) of softwoods and hardwoods, both green and air-dry, carried out at the Technical Wood Research Institute, Stuttgart. The kilns used (airtight steel chambers) are described in detail. In experimental seasoning tests: (1) no discontinuity in the behaviour of wood was observable when the boiling point of water (100° C. under atmospheric pressure) was passed; (2) quick-run seasoning of air-dry and of green Spruce boards (24 mm.) and planks (48 mm.) gave, on the whole, better results than slower seasoning, which always darkened the wood; (3) green Beech boards were not suitable for high-temperature seasoning, but air-dry Beech gave good results; (4) Spruce was seasoned without injecting additional steam (in some cases all vents in the chamber were closed, and the condensed water vapour escaped through condensation traps), but for Beech wood careful humidity control was necessary; (5) the short runs had the following duration: 24-mm. Spruce (air-dry) 6 hr., (green) 10 hr.; 48-mm. Spruce (green) 15½ hr.; 38-mm. Beech (air-dry) 17½hr. The corresponding reductions in moisture content were from: 30·5 to 13·5%; 76 to 14·9%; 67 to 19·3%; 26·7 to 4·8%. Satisfactory uniformity of moisture content was achieved after seasoning. Several special trials showed that high-temperature seasoning does not reduce the bonding strength of Beech when glued with Kaurit W glue. Tests were also carried out for determining the acetyl (acetic acid) content (Freudenberg method): high-temperature-seasoned wood contains 0·1–0·6% less acetic acid than naturally dried wood.

765. FESSEL, F. Anlagen zur künstlichen Holztrocknung. **[Plant for artificial timber seasoning.]** *Holz Roh- u. Werkstoff* 9 (4), 1951 (151–8). 28 refs. [G.g.] P.R.

A survey of the existing types of plant for the seasoning of wood at high temperatures.

766. OGURA, T., and ONUMA, K. **Studies on the drying equipment for woods. 1. On the inlet duct in the natural ventilated kilns.** *Bull. For. exp. Sta. Meguro, Tokyo* 45, 1950 (71–93). 4 refs. [Jap.e.]

Presents the results of hot-wire anemometer studies on the air current coming from the inlet duct, and deduces equations to design the ducts so as to obtain a uniform flow of air.

767. ELLWOOD, E. L., GOTTSTEIN, J. W., and WRIGHT, G. W. **Vapour drying Australian grown timbers.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 183, 1950 (1–2). P.R.

Some of the results of laboratory and pilot-plant investigations on the suitability of the vapour drying process for drying the collapsing, 'Ash'-type Eucalypts, *E. gigantea*, *Nothofagus cunninghamii*, and *Pinus radiata*. The collapse-susceptible 'Ash' Eucalypts and *N. cunninghamii* cannot be satisfactorily seasoned at the high temperatures used in vapour drying; yet the degrade is much less than when the same timbers are seasoned at the same temperature by usual methods. *P. radiata* can be dried readily without degrade from the green condition to a moisture content of *ca.* 12% in about 5 hours.

768. GUERNSEY, F. W. **Collapse in Western Red Cedar.** *B.C. Lumberm.* 35 (4), 1951 (44–5, 62). 4 refs.

The following conclusions are drawn from experimental data and observations of the Vancouver Laboratory of the Forest Products Research Division and of sawmill operators: (1) The logs subject to collapse appear to come from definite areas, generally low, swampy ground. (2) It is difficult if not impossible to predict collapse from the log's appearance. (3) Timber from butt logs appears to be most subject to collapse, but some from second logs has also been found to collapse. (4) There appears to be a relationship between the weight of a board and its tendency to collapse. If degrade is suspected, heavy material should be seasoned separately, either by air drying or a very mild kiln treatment. (5) Collapse occurs as soon as drying begins, and continues until fibre-saturation point is reached. (6) There appears to be a relationship between (*a*) collapse and resin streaks or pockets in timber for some areas, (*b*) honeycombing or explosion and 'wet spots'. (7) Air drying before kiln drying appears to offer the best solution; where this is impossible an initial kiln temperature not higher than 120° F. is recommended.

769. BROWN, W. H. **Seasoning.** *Timber News* 59 (2143), 1951 (199–200).

Describes two instances of using urea for preventing surface checking of Douglas Fir during seasoning. Before being kiln dried, 4 × 8 and 4 × 12 in. merchantable lengths were sprayed with water, and urea was applied by hand to all faces (*ca.* 60 lb./1,000 sq. ft.); the timber was then close piled for about a day. When kiln dried in the usual way, the planks showed a considerable reduction of surface checking. Urea was ineffective with a faster kiln schedule and also with green English Oak dried in the open air.

848. *Timberyard Practice. Handling and Storage of Timber*

See also Nos. 352, 654, 733.

770. BELL, G. E., and MARTIN, P. E. **Lumber handling at the rear of the mill.** *Timber of Canada* 11 (8), 1951 (28–31, 54–5). 5 refs.

Summarizes results of a study at 8 sawmills and 1 retail and 1 wholesale yard on methods of handling sawn timber and the effect of such factors as the distance of the stacks from the mill, mode of unloading from the green chains and of stacking in the yard, on the various methods. Amongst conclusions drawn are:—(1) The lift truck and the lift truck working in conjunction with a straddle truck are the two most efficient methods of handling sawn timber; costs for the lift truck alone were 32 cents per 1,000 bd. ft., as compared with $1·25 for horse, teamster and two or more wagons, and $1·21 for a truck, driver and helper. (2) The handling cost per 1,000 bd. ft. increased with distance of the stacks from the mill. (3) There were many minor variations to the two main methods of unloading timber from the green chain by (*a*) forming unit loads and transferring them to the carrier and (*b*) forming unit loads directly on to the carrier; differences in efficiency and cost are small. (4) Longer time was needed to make a high than a low stack of the same unit of volume. (5) Loading directly into railway wagons from the yard stacks cost between $1.00 and $2.00 per 1,000 bd. ft., the figure varying with size and weight of timber and labour costs. (6) In operations using a lift truck to stack timber, stacks were as well stickered as those made by hand. (7) Average costs of handling timber from the green chain into the yard stacks was $1.49 per 1,000 bd. ft.

771. CHRISTIANSEN, R. Om befuktning av slipved. **[Humidification of wood for mechanical pulp.]** *Pap. ja Puu* 33*B* (3), 1951 (60–4). [Sw.e.] P.R.

The moisture content of floated wood varies with the position of the bolt in the bundle, from 15 to 60% of the total weight of the wood. The average moisture content of bolts above water level is 20–25% and of those below, 50–55%. The Warkaus mill has devised and patented a bundle-turning machine with a capacity of *ca.* 100 bundles per 8-hr. shift, using a crew of 3. The minimum moisture content, 3–4 weeks after turning, is *ca.* 25% and the moisture content of the part of the bundle now above water is reduced by *ca.* 10%. This greater uniformity in moisture content gives a more even quality to the pulp, and the strength of the pulp at different freeness values is greater. To prevent too rapid drying out of the upper part of the bundles, spray guns have been installed at the place where bundles are floated after turning. It has been found unnecessary to spray bundles which are removed from the pond for land storage during the winter, because drying out is slight between September and April; bundles stored on land will, however, be sprayed in April and early May, when the average moisture content decreases by 3–5%.

772. PIIPPONEN, H. Hiomopuun tehdasvarastointi. **[Mill storage of pulpwood for mechanical pulp mills.]** *Pap. ja Puu* 33*B* (4*a*), 1951 (149–52). [Fi.e.] P.R.

At the Tampella mills, Inkeroinen, pulpwood is bundled on arrival and stored in a floating channel, and after a certain time the bundles are turned upside down. This increases the average moisture content (20–25% for pulpwood carried by road or rail, and 30% for floated wood), bringing the bolts nearer to a uniform moisture content of 40%, the

optimum for mechanical pulping. Green timber has a suitable moisture content for grinding, but transport costs limit its use.

85. GRADING OF WOOD AND WOOD PRODUCTS

See also No. 576.

852. *Detection, Recognition and Assessment of Injuries and Defects*

See also Nos. 620–1, 698, 768.

773. GRAHAM, P. H. **There may be metal in them thar peeler bolts.** *Veneers & Plyw.* 45 (5), 1951 (14–5). P.R.

Describes metal detectors now in use in many American sawmills. The detectors are modelled on the Army mine detector, and are guaranteed to detect the presence of an '8-penny nail' embedded in the heart of a 24-in log. Both portable and stationary detectors have been developed for use at production plants. Magnetic material in the bark or in bark-included soil can be a source of interference. [Cf. *For. Abstr.* 9 (No. 351).]

774. FARMER, R. H., and CAMPBELL, W. G. **The composition and origin of a crystalline deposit in Iroko wood (*Chlorophora excelsa* Benth. and Hook.f.).** *Emp. For. Rev.* 30 (1), 1951 (64–5 + 2 photos). 8 refs.

The occurrence of a crystalline deposit superimposed upon the familiar calcareous concretion frequently found in fissures in the wood of *Chlorophora excelsa* [cf. *For. Abstr.* 8 (No. 2468)] has been observed for the first time. The crystalline material has been identified as a hydrate of calcium malate having the composition $CaC_4H_4O_5.3H_2O$, and it is considered probable that, in common with the more usual inorganic deposit, it is formed as a result of slow evaporation of sap that has seeped into cavities in the growing tree.

853. *Grading of Logs*

See also No. 348.

775. SWEET, C. V., and FOBES, E. W. **New log studies to aid graders.** *Wood, Chicago* 6 (5), 1951 (22–3).

Describes in some detail the results of two mill studies (southern Oregon, and northern Washington) made in order to work out improved correlations between external appearances and internal qualities of logs. The external defects of each log were charted and the interior defects as revealed on a peeler recorded. The Oregon Douglas-Fir logs (cut from 400-year-old trees, growing on site III, log diam. 21–54 in.) showed a surprisingly large number of overgrown-knot indicators even in the butt and second logs. There was a ring of clear wood, 4–6 in. deep between the bark indicators and the actual knot, and the yield of patchable face in such logs ranged from 4 to 64% in all log grades, and from 29 to 64% in the top grade. The Washington logs showed fewer so-called overgrown knots. Bumps or burls were rather frequent and almost invariably meant a knot immediately underneath. Recent investigations at Madison indicate that growth-ring patterns (in transverse section) can be used to assess quality. One particular ring pattern was found which apparently may be used as an index point in determining the dividing line between face and back veneer zones. It is to be expected that other external visible characteristics might make it possible to predict very closely the high-quality portion of Douglas-Fir logs.

86. PULP INDUSTRIES. CHEMICAL UTILIZATION OF WOOD

861. *Paper and Cardboard Industry (Pulp, Paper, Cardboard, Fibreboards)*

See also Nos. 576, 585, 588, 639, 771–2.

776. **Tappi routine control methods.** Technical Association of the Pulp and Paper Industry, New York. 1950. P.R.

A set of 157 routine control procedures (including various tests on wood chips), with a numerical and an alphabetical index.

777. ALGAR, W. H., GIERTZ, H. W., and GUSTAFSSON, A.-M. Fiberstruktur och massaegenskaper. (1) En arbetshypotes. [**Fibre structure and pulp properties. (1) A working hypothesis.**] *Svensk PappTidn.* 54 (10), 1951 (335–44). 13 refs. [Sw.e.g.] P.R.

778. RISI, J. L'utilisation des essences feuillues dans la fabrication des pâtes et papiers. [**The use of broadleaved species in the manufacture of pulp and paper. [A review].**] *For. et Conserv.* 3 (4), 1951 (191–201). 27 refs. [F.]

779. MAARTMANN, K. Småvirke. [**Small wood.**] *Norsk Skogind.* 5 (2), 1951 (39–50). [Nor.e.] P.R.

Discusses the use in Sweden of small wood in sulphite and sulphate pulping and for wallboards, and describes suitable barking, chipping and sorting apparatus and transport arrangements on the railway and within the mill.

Pulping and Pulp

See also No. 672.

780. PEDRO, S. DE. La celulosa de agotados de madera de castaño. [**Pulp from Chestnut waste from tannin extraction.**] [*Bol.*] *Inst. for. Invest. Exp. Madrid* 21 (53), 1950. pp. 20. [Span.]

In tests to find a suitable method of pulping such Chestnut wood residues by the soda process, best results were obtained by cooking for 5 hr. at 165° C. and a pressure of 7 atm., after which the pulp, which makes excellent newsprint, needs to undergo further bleaching. It was found advisable to eliminate all bark and extraneous matter before cooking.

Fibreboards

See also No. 579.

781. **Hardboard—the forest industries' latest major development.** *Lumberm.* 78 (3), 1951 (103, 122).

Lists hardboard plants in the U.S.A., discusses production costs, and gives figures for hardboard production throughout the world.

782. RISI, J. **New European boards made from wood waste.** *Wood-Worker, Indianap.* 69 (12), 1951 (46, 50–1). P.R.

A brief survey of recent developments in Europe in the field of binder-boards. The following boards are described: Novopan, Homogenholz N and T, all invented and/or manufactured in Switzerland. The large capital investments which these involve, are not required for some very recent methods, such as the Lignova process (Germany), and the Harder and Lignorite processes (Switzerland).

783. SCHWARTZ, S. L., and BAIRD, P. K. **Effect of molding temperature on the strength and dimensional stability of hardboards from fiberized water-soaked Douglas-Fir chips.** *Paper Tr. J.* 132 (17), 1951 (20, 22, 24–5). 18 refs. P.R.

The hardboard tested was made without resorting to steam cooking, the incorporation of synthetic resins, or prolonged heat treatment. The drying and heat treatment were achieved in one short (*ca.* 10 min.) operation in a hot press (slightly in excess of 240°C). The increases in flexural strength and dimensional stability were comparable to those obtained by the commercial 4- to 5-hour kiln-drying procedure. Data for various properties are tabulated for moulding periods of 5, 25, and 75 minutes.

864. *Utilization of Lignin*

See also Nos. 641–2.

784. ANDERSON, I. V. **Lignin for golf greens and other horticultural uses.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 87, 1951. pp. 4.

Lignin proved satisfactory as a soil conditioner for golf courses and in greenhouses, but not as a mulch for strawberries.

866. *Utilization of Wood Extractives*

See also Nos. 643–51, 780.

785. SAKORNBUT, S. S. **Resinous extractives from Southern Pine wood.** *Tech. Rep. Tex. agric. mech. Coll. For. Serv.* No. 1, 1950. pp. 38. 37 refs. P.R.

A review of world literature on the subject, with a description of chemical methods used for the determination of the extractives and of the chemical composition of sawdust samples, and the results of the tests. The total non-volatile resin from 34 random samples ranged from 1·5 to 7·2% of the true dry weight of the wood material. The % of steam-volatile oils of 8 freshly cut sawdust samples ranged from 0·22 to 0·40. *From author's summary.*

786. KURTH, E. F. **Waxes from wood waste.** *U.S. Patent* No. 2,526,607, Oct. 17, 1950. *Chem. Abstr.* 45 (3), 1951 (1346*b*). P.R.

867. *Destructive Distillation*

787. BURGOYNE, J. H., and RICHARDSON, J. F. **Influence of zinc chloride on the ignition of Scotch Pine and its charcoal.** *Fuel* 30 (1), 1951 (13–6). 7 refs. D.S.I.R.

The effect of impregnation with various proportions of $ZnCl_2$ upon the pyrolysis and ignition of Scots Pine has been examined. The presence of the salt lowers the temperature at which carbonization begins, increases the yield of charcoal at a given temperature, and raises the ignition temperature of the charcoal as determined after cooling. The impregnation of pre-formed charcoal with ZnCl also raises the ignition temperature. However, impregnation of the wood with moderate additions of $ZnCl_2$ lowers the ignition temperature of the charcoal formed in the presence of O during the ignition test carried out on the wood itself. *Authors' summary.*

788. ARIES, R. S. **New method for making charcoal.** *Sth. Lumberm.* 182 (2279), 1951 (76, 78).

Describes the Mellman continuous process for the production of charcoal, in which the temperature for carbonization is maintained by automatically recycling part of the gases produced during carbonization, so that no additional heat from solid or gaseous fuel is needed. The retort is normally of a capacity to produce about 5 tons of charcoal a day. Yields from one cord of air-dried northern hardwoods average 48–52 bushels. There is no substantial difference in yields from wet and dry wood, but the daily output is higher when dry wood is used. Wood (billets, short sections, chips, slabs and edgings, can all be used) is fed into a hopper at the top of the retort, and passes down successively through the drying, distillation, and carbonization zones, and the charcoal, which is dense, hard and of a high C content with few fines, is discharged into sealed quenching drums, where it is left to cool for 5–7 hours. The gases are led off by pipes, mixed in a specially designed carburettor and burned as they pass through its tuyeres. If used in the woods, the retort should be mounted on skids and passed between long piles of wood, carbonizing the material as it goes. It is then moved to another site. The quenching drums serve as containers for transporting the charcoal.

789. MIURA, I., SHIBAMOTO, T., SATOO, O., and SATOO, Y. **Studies on carbonization of wood (VII). Comparative experiments in making of charcoal by four kilns, 'Nooringama No. 1,' 'Tokitagama', 'Ooishigama', and 'Miura's Standard Kiln'.** *Bull. Tokyo Univ. For.* No. 38, 1950 (1–41). 3 refs. [Jap.e.]

Of the 4 earthen kilns, which are illustrated in diagrams and photographs, Nooringama No. 1 and Tokitagama gave the most satisfactory results in speed of production, yield and quality of charcoal. With improved control of air and smoke, the other kilns would probably give equally good results. *From authors' summary.*

790. SHIBAMOTO, T., and SATOO, O. **Studies on carbonization of wood. (VIII) 'Kiyozumi earthen kiln G-type'.** *Bull. Tokyo Univ. For.* No. 38, 1950 (43–57). 2 refs. [Jap.e.]

The newly designed kiln (illustrated) is of the standard earthen type, simple to construct, and needing no special materials. Simple and efficient in operation, it produces high-quality charcoal. *From authors' summary.*

791. OSARA, N. A. **Substitution of liquid fuels by other materials in Finland during the Second World War.** *Paper, Fourth World Power Conference, London* No. 7, Sect. *C*2, 1950. pp. 5. [E.e.f.] D.S.I.R.

The main part of the paper deals with the use of wood gas, and contains information on the results and experience obtained with wood and charcoal

gas-producers in motor cars. *From author's summary.* [Cf. *For. Abstr.* 13 (Nos. 580, 718).]

792. BLOMQUIST, U. O., and WIDELL, T. A. **Wood and charcoal producer gas for stationary and traction purposes in Sweden 1939–45.** *Paper, Fourth World Power Conference, London* No. 7, Sect. *D*2, 1950. pp. 16. [E.e.f.] D.S.I.R.

At the end of World War II, charcoal and wood were used, almost in equivalent quantities, as the only fuels for producer gas in Sweden, and the producer-gas system was very safe in working. Two-stroke hot-bulb engines were developed that gave a higher efficiency with producer-gas than with oil. *From authors' summary.*

793. RISI, J. **Ammonia fertilizers from wood waste.** *Canadian Chemistry and Process Industries, Toronto* 34 (12), 1950 (972–4). 4 refs. D.S.I.R.

A brief discussion of a new project based on the more efficient use of de-Lacotte generators in which waste wood is burnt and converted into H and N in the optimum proportion for the synthesis of NH_3. [Cf. *For. Abstr.* 11 (Nos. 529, 3112).]

89. OTHER ('MINOR') FOREST PRODUCTS

892. *Vegetable Products*

See also Nos. 87–90.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 639, 827.

794. BODALSKI, T. Les matières premières végétales du tanin de Pologne. **[Vegetable sources of tannin in Poland.]** *C.R. Sci. math. nat. Acad. polon.* 1949 (1/2), (12–3). [F.] O.R.S.

Tanning materials studied include bark of Oak, Willow, Spruce and Alder, and the galls of *Cynips kollari* on Oak.

795. GREAVES, C. **Canadian wood bark as a source of tannin.** *Pulp Paper Mag. Can.* 52 (4), 1951 (118, 121–2).

The use and supplies of Canadian vegetable tanning materials (Western and Eastern Hemlock bark, Sumach leaves, and Spruce and Douglas Fir bark), of sulphite waste liquor and of synthetic tannins are discussed. Large-scale tests are planned of the properties of tannins from Spruce and Douglas Fir bark.

796. KURTH, E., HUBBARD, J. K., and GEKELER, M. **Extracting tannin from Douglas-Fir bark.** *Leather and Shoes, Chicago* 118 (22), 1949 (22–3, 26, 28–9). 5 refs. B.L.M.R.A.

The tannin content of sound bark was found to range from 7·6 to 18·3%, and to be highest in the bark from young trees. The tannin belongs to the phlobatannin class. It may apparently be extracted with water up to 200° F. (and, with Na_2SO_3 or Na_2CO_3 added, even up to 212° F.) without loss from being converted to insoluble phlobaphenes. Preliminary work was done on integrated tannin and wax extraction with favourable results.

797. HILBERT, F. L. **Eucalyptus.** *Leather and Shoes, Chicago* 118 (15), 1949 (20, 22, 28). B.L.M.R.A.

Of some 1,800 species in the Eucalyptus family, about 30 are tannin-producing. A single tree may give 125 lb. of kino-tannic acid per season. *Author's summary.*

798. HILBERT, F. L. **Mallet bark and extract.** *Leather and Shoes, Chicago* 118 (24), 1949 (19, 24). B.L.M.R.A.

Mallet bark is the bark from several *Eucalyptus* species: *E. erythronema, E. falcata, E. gardneri, E. redunca, E. occidentalis,* and *E. occidentalis astringens.* It contains 45–55% extractable tannin, and yields very strong tanning liquors.

799. BRIGGS, L. H., and LOCKER, R. H. **Chemistry of New Zealand *Melicope* species. Part IV. Constituents of the bark of *Melicope simplex*. Part V. A synthesis of 6-hydroxy-3:5:7-trimethoxy-3′: 4′-methylenedioxyflavone, melisimplexin, and melisimplin.** *J. chem. Soc.* Sept., 1950 (2376–81). [Auckland University College, Auckland, New Zealand.] O.R.S.

Cf. *For. Abstr.* 11 (No. 3163).

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also Nos. 58–60.

800. GITHENS, T. S. **Drug plants of Africa.** University of Pennsylvania Press, University Museum, Philadelphia. 1948. pp. 125. 57 refs. (*African Handbooks* No. 8). L.S.

Summarizes information on the known species, and presents a comprehensive list of the plants and their uses.

801. CHAUDHRI, I. I. **The medicinal plants of Chitral State.** *Pakistan J. For.* 1 (2), 1951 (154–8).

802. KHATTAK, G. M. ***Ephedra* in Baluchistan.** *Pakistan J. For.* 1 (1), 1951 (37–40).

Occurrence, harvesting, marketing and uses.

803. DAS, S. B. **A note on the economic importance of *Phyllanthus emblica*.** *Indian For.* 75 (7), 1949 (1951), (243–5).

Describes the use of bark, leaves and fruit in the Ayurvedic system of medicine.

804. BICK, I. R. C., and TODD, A. R. **Alkaloids of *Daphnandra* species. Part I. Repandine [from *D. repandula*].** *J. chem. Soc.* 1948 (2170–3). O.R.S.

805. BICK, I. R. C., EWEN, E. S., and TODD, A. R. **Alkaloids of *Daphnandra* species. Part II. Daphnandrine, daphnoline, and aromoline.** *J. chem. Soc.* Nov., 1949 (2767–74). [University Chemical Laboratory, Cambridge.] O.R.S.

806. BICK, I. R. C., and TODD, A. R. **Alkaloids of *Daphnandra* species. Part III. Micranthine.** *J. chem. Soc.* June, 1950 (1606–12). [University Chemical Laboratory, Cambridge.] O.R.S.

The structure of micranthine, the sole alkaloidal constituent of a specimen of the bark of *D. micrantha* grown in Queensland, has been determined.

807. BOTTOMLEY, W., and WHITE, D. E. **The chemistry of Western Australian plants. IV. *Duboisia hopwoodii*.** *Aust. J. sci. Res.* 4*A* (1), 1951 (107–11). 22 refs. P.R.

The nicotine and nornicotine content of the plant could not be correlated with locality, season, or soil type; examination of fresh leaves showed the alkaloid content to be considerably reduced on drying. Samples of nicotine and nornicotine have

been prepared and ursolic acid and a quercetin glycoside have been isolated from *D. hopwoodii* leaves. *From authors' summary.*

808. MACHADO, O. X. DE BRITO. Tinguaciba da restinga, *Fagara arenaria* Engl. [***Fagara arenaria***]. *Rodriguésia* 12 (24), 1949 (79–119). 31 refs. [Port.]

Ecology and chemical composition of the species, which has medicinal properties, with some micro-photographs of wood sections.

809. HIRST, E. L., HOUGH, L., and JONES, J. K. N. **Constitution of the mucilage from the bark of *Ulmus fulva* (Slippery Elm mucilage). Part III. The isolation of 3-monomethyl D-galactose from the products of hydrolysis.** *J. chem. Soc.* Feb., 1951 (323–5). [The University, Bristol.] O.R.S.

810. CHIU, S.-F. **Effectiveness of Chinese insecticidal plants with reference to the comparative toxicity of botanical and synthetic insecticides.** *Journal of the Science of Food and Agriculture, London* 1 (9), 1950 (276–86). 59 refs. O.R.S.

The effectiveness of 9 species was tested in laboratory and field tests against 40 insect species that attack crop plants. Finely ground seeds of *Millettia pachycarpa* are effective as stomach and contact poisons. The root barks of *Tripterygium forestii* and of *Celastrus angulata* act as a repellent and stomach poison; the latter is apparently also a contact poison. The flower of *Rhododendron molle* is effective as a stomach and contact poison for certain insect species only. These plants are all widely distributed in China and have great possibilities as a source of cheap insecticide.

811. HENKER, G. A., and HUSTON, M. J. **Yopo, a South American snuff [from *Piptadenia peregrina*].** *Canadian Pharmaceutical Journal, Toronto* 83 (18), 1950 (8–9). *Chem. Abstr.* 45 (3), 1951 (1306*c*). P.R.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 235, 342, 796, 827.

812. SHIBAMOTO, T., MINAMI, K., and MIYAZAKI, M. **On the essential oil of 'Todomatsu'-balsam. (Studies on 'Todomatsu'-balsam II).** *Bull. Tokyo Univ. For.* No. 38, 1950 (95–112). 20 refs. [Jap.e.]

The yield of essential oil obtained by steam distillation of 'Todomatsu' balsam (resin of *Abies mayriana* and *A. sachalinensis*) was 23·5% of the original balsam. The various components isolated were α- and β-pinene, camphene, bornyl acetate and an alcoholic substance of b.p. 167–175° C. The fraction with b.p. 160–174° C. gave an unidentified nitrosochloride. [Cf. *For. Abstr.* 12 (No. 554).] *From authors' summary.*

813. MALEVSKAJA, S. S., and HARAD, S. D. **O pervičnyh smoljanyh kislotah, vydelennyh iz živicy russkoi eli. [Primary resin acids isolated from the oleoresin of the Russian [Norway?] Spruce.]** *Žurnal Prikladnoĭ Himii, Moskva* 23 (2), 1950 (153–4). 1 ref. [Russ.] D.S.I.R.

The oleoresin was found to contain *d*-pimaric, *l*-pimaric, and α-sapinic acids.

814. BARDYŠEV, I. I., PIRJATINSKIĬ, A. L., BARDYŠEVA, K. V., and ČERNJAEVA, O. I. **O sostave ostečestvennyh skipidarov iz obyknovennoi sosny. [Composition of turpentine oils obtained in the USSR from Scots Pine.]** *Žurnal Prikladnoĭ Himii, Moskva* 23 (2), 1950 (203–10). [Russ.russ.] D.S.I.R.

The hydrocarbon-terpene fractions of commercial samples of turpentine oils obtained from Scots Pine by the retort (directly, and indirectly, heated), extraction, and sulphate methods, have the same qualitative composition as turpentine oil from oleoresin: α-pinene, β-pinene, Δ^3-carene, limonene, dipentene, and terpinolene, as well as a component of unknown structure called '*d*-terpene'. *From authors' summary.*

815. PEJOSKI, B. Prilog upoznavanju naših borovih smola. (Smola alepskog bora.) [**Contribution to the knowledge of our Pine resins. (The resin of *Pinus halepensis*.)**] *Šum List* 74 (7/8), 1950 (297–304). 20 refs. [Croat.croat.f.]

Laboratory experiments have shown that, by filtering crude oleoresin of *P. halepensis*, a yield of 24% of 'balsam' is obtained. From this, it is estimated that a seasonal yield of *ca.* 300 g. of 'balsam' per face can be realized, if the filtration is carried out on the spot. This should be done in sunshine, from April until October, using plain white linen. The 'balsam' obtained is of yellowish colour, pleasant odour, density 0·980, and refractive index 1·517 (20° C.). The turpentine oil has a density of 0·858 and refractive index of 1·468 (20° C.). Tests have shown that the 'balsam' of *P. halepensis* resembles that of *P. peuce*, as far as its use in microscopy and optical work is concerned. [Cf. *For. Abstr.* 12 (No. 651).]

816. [**Resin from *Altingia excelsa*.**] *For. Res. India Burma 1947–8*, 1950 (78–9).

Examination of the pale yellow, odorous resin exuded from wounds in *A. excelsa* (data tabulated) showed that it does not resemble storax and cannot, therefore, be considered a substitute for it. Its low melting point and its solubility in organic solvents indicate that it might serve as a substitute for a softer type of resin, such as gum mastic, in varnishes.

817. BRYANT, L. H. **Variations in oil yield and oil composition in some species of Eucalypts and Tea trees.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 4 (Spec. Issue), 1950 (6–10).

The importance of proper sampling and methods of ensuring it are discussed. An investigation was made on variations of oil yield with age of leaf for *Eucalyptus* spp. For *E. dives* yields varied from 4·0% for aged to 9·6% for young leaves, and for *E. australiana* from 3·8 to 7·0% and in another series from 5·8 to 10·1%, while for *E. smithii* there was no significant difference between old and young leaves, the leaves of this species being coated with a wax-like film which may prevent loss of oil by volatilization. Similar investigations were made on variation in oil composition. Samples of oil from leaves of different ages from two trees of *E. dives* were analysed for their content of phellandrene, which varied from 14% for aged to 24% for young leaves. There was no significant difference in total phellandrene content between the two trees, or in that of leaves of the same age from them. Similar results were obtained from *E. australiana*; phellandrene was absent from a number of older leaf

age groups. The cineol content for *E. australiana* was not significantly different for the different leaf groups but yield dropped with age; *E. smithii* showed a pronounced rise in cineol content in the older leaves, but yield remained constant. Studies to determine the variation of oil yield and composition were made on two physiological forms, *E. dives* var. 'C' and *E. dives* type. In the former, yield of oil varied from 1·5 to 5·6% and the cineol content of the oil from 4·6 to 7·0%. Nine of the 50 trees studied contained phellandrene in amounts varying from 4 to 9%. In the type, oil yields varied from 2 to 4·6% on a fresh-weight basis. The piperitone content varied from 35·0 to 53·0% and that of phellandrene from 13·0 to 32·0%. Preliminary studies on a few samples (40 and 30 respectively) of *Melaleuca alternifolia* and *Leptospermum citratum* showed for *L. citratum* oil yields of 3·4–6·0% with 53–85% total aldehyde content, and for *M. alternifolia* yields of 4·5–10·4% and cineol contents ranging from 7 to 64%; in 3 distinct series, 7–15%, 31–40% and 54–64%. Unfortunately, the highest yielders did not possess the best oils. [Cf. *For. Abstr.* 11 (Nos. 2184–7; 3186–7); 12 (Nos. 1502–4, 3301–3).]

818. Naves, Y.-R., and Ardizio, P. Études sur les matières végétales volatiles C. Sur l'huile essentielle des feuilles du *Myroxylon pereirae* Klotzsch., arbre d'où l'on obtient le baume du Pérou. **[Studies on vegetable volatile substances C. The essential oil of the leaves of *M. pereirae*, the tree from which Balsam of Peru is obtained.]** *Helvetica Chimica Acta, Basel* 33 (1), 1950 (169–70). [F.f.] O.R.S.

Neither nerolidol nor farnesol could be found in the essential oil of the leaves of *M. pereirae*. These alcohols should be looked for in the wood substance. *From authors' summary.*

819. Weiss, M. Une enquête modèle sur les oléagineux—la mission de la F.A.O. au Venezuela. **[A model survey of oil-producing plants—the F.A.O. mission to Venezuela.]** *Oléagineux, Paris* 4 (10), 1949 (573–9). [F.] O.R.E.

The results of the 1948 survey indicate that, although the country possesses a large variety of oil-bearing palms, they grow over too wide an area to make exploitation economical. The commission recommends large-scale planting of *Elaeis guineensis* and other oil-producing plants.

820. Hilditch, T. P., Meara, M. L., and Patel, C. B. **The component acids and glycerides of *Pentaclethra* (Leguminosae) and *Lophira* (Ochnaceae) seed fats.** *Journal of the Science of Food and Agriculture, London* 2 (3), 1951 (142–8). 13 refs. [Liverpool University.] O.R.S.

The seed fats of *P. macrophylla*, *P. eetveldeana*, *L. alata* and *L. procera* were examined. Results are tabulated.

821. Bennett, H., and Islip, H. T. ***Licania mollis* and *L. venenosa* fruits from British Guiana.** *Colon. Plant Anim. Prod.* 1 (3), 1950 (232–6).

The kernels of both species contain a very low % of oil in comparison with Oiticica (*L. rigida*) kernels. Analysis of both oils shows that they resemble that from *L. rigida*. It is doubtful whether their exploitation would be economically profitable.

822. Stephen, A. M. ***Acacia mollissima* Willd. Part I. The component sugars and aldobiuronic acid of Black Wattle gum.** *J. chem. Soc.* Mar., 1951 (646–9). [National Chemical Research Laboratory, Pretoria.] O.R.S.

823. Griffiths, C. **Locust Bean gum. A modern thickening agent from a biblical fruit.** *Manufacturing Chemist, London* 20 (7), 1949 (321–4). L.S.

Chemistry, uses and viscosity of gum from *Ceratonia siliqua*. [Cf. *For. Abstr.* 13 (No. 341).]

824. Alde, M. R., Agcaoili, F., and J.-Cochico, R. ***Jatropha curcas* Linn. (Tuba) as a source of natural dye.** *Philippine Journal of Science, Manila* 77 (1), 1947 (55–60). I.I.E.

Fair results were obtained in dyeing cotton yarn.

825. Holgate, K. C. **Changes in the composition of Maple sap during the tapping season.** *Bull. N.Y. St. agric. Exp. Sta.* No. 742, 1950. pp. 13.

826. Harrison, S. G. **Manna and its sources.** *Kew Bull.* 1950 (3), (407–17). 19 refs.

892.7. Fruits, Seeds. Fibres, Yarns and Flosses

See also No. 116.

827. Poggi, R. Il lentisco e la sua utilizzazione. **[*Pistacia lentiscus* and its utilization.]** *Chimica, Milano* 4 (5), 1949 (189–94). 83 refs. [It.it.] L.S.

Following earlier research in the extraction of oil from the fruit of the Lentisk, studies were made of the extraction of a dye-stuff from the pulp residue after oil extraction (a yield of 0·27% was obtained) and from dried leaves (0·13%). Extraction of dried and pulverized twigs yielded about 9% tannin.

828. Brozzetti, P. Ricerche sulla composizione chimica, la digeribilità ed il valore nutritivo del residuo dell'estrazione dell'alcol dalle bacche del corbezzolo (*Arbutus unedo* L.). **[The chemical composition, digestibility, and nutritive value of residues from the extraction of alcohol from *Arbutus unedo* berries.]** *Ann. Fac. Agr. Perugia* 4, 1947 (82–103). 16 refs. [It.it.g.e.] C.G.B.

Experimental feeding of pigs showed that these residues were unsuitable for use as fodder.

829. Plouvier, V. Sur la composition chimique des fruits de *Clerodendron trichotomum* Thunb. et *Callicarpa japonica* Thunb. (Verbenacées). **[The chemical composition of fruits of *C. trichotomum* and *C. japonica*.]** *C.R. Acad. Sci., Paris* 231 (25), 1950 (1546–8). 1 ref. [F.] O.R.S.

830. Wilson, S. D., Jui, W., and Shu-Chien, S. **The composition of the seeds of the Maple tree (*Acer truncatum* Bge).** *Peking Natural History Bulletin, Peiping* 17 (4), 1949 (217–21). 6 refs. [E.] I.I.E.

A chemical analysis showed the seeds to be rich in oil and proteins. The composition differs markedly from that of *Acer saccharinum* seeds, which contain nearly 42% starch and 3½% oil, whereas *A. truncatum* seeds contain no starch and over 50% oil.

893. *Animal Products*

See No. 345.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. GENERAL

See also Nos. 575–6, 864.

831. DIKER, M. Turkiyede ormancılık: dün, bugün, yarın. [**Forestry in Turkey: yesterday, today, to-morrow.**] *T.C. Tarım Bakanlığı Orman Genel Müdürlüğü Yayınlarından* No. 61, 1947. pp. [12] + 132 + 13 dgms., 12 maps. [Turk.] With supplement: Ormanlarımızın saglık durumu haritası. [**Map of the health condition of our forests.**] *T.C. Tarım Bakanlığı Orman Genel Müdürlüğü Yayınlarından* No. 61*a*, 1950. pp. 1 + map.

Part I (pp. 3–57) of this book deals first with existing conditions: the forests and their working organization with its equipment and objects; and secondly with forest history from the time of the Ottoman Empire onwards, discussing in particular the provisions of the Forest Law (No. 3116) of 1937 and the results of its application up to 1946. Part II (pp. 57–132) reviews the forest resource in relation to the main facets of the national economy and agriculture, and discusses in detail how forestry can be better organized to meet these varied needs. Besides data on forest area, distribution, undertakings etc. the coloured maps and diagrams illustrate the distribution of population and livestock, their recent increases, and the gap between supply and demand.

The separate coloured map, which was intended for inclusion in the book, shows the main zones endangered by fire, insect, man and beast.

832. DIKER, M., and SAVAŞ, K. Yurdda orman azalması. [**The homeland's dwindling forests.**] *T.C. Tarım Bakanlığı Orman Genel Müdürlüğü Yayınlarından, Ankara* No. 73, 1947. pp. 31 + 30 pp. of dgms. and tbls. + 2 maps. [Turk.] X.

A study of forest deterioration and disappearance based on two detailed and comparable surveys of the forests of Antalya, in 1926 and 1946. For each, a coloured stock map (1/200,000) is presented, showing the areas under high forest and coppice, the degraded and the denuded portions of each, and approximate extent of conifer, Oak and maquis. Coloured histograms supported by tables give area, % and valuation statistics for each of the 28 working units into which the whole area of 353,690 ha. is divided. In 20 years the proportion denuded and degraded has increased by some 36%.

902. *History of Forests and Forestry*

833. GÉRARD, P. Étude de l'évolution forestière dans la principauté de Stavelot et dans le comté de Salm. [**Forest development in the principality of Stavelot and in the county of Salm.**] *Bull. Soc. for. Belg.* 58 (4), 1951 (129–63 + 5 dgms.). 30 refs. [F.f.]

The evolution of these forests is traced from prehistoric times, using the evidence of pollen analyses, historical records etc. It is concluded that the degradation of the forests began only in the late Middle Ages, caused chiefly by intensive grazing and partly by the growth of industry. The tanning industry, however, being dependent on Oak woods, had a conserving effect; it favoured Oak at the expense of Beech.

834. WINTERS, R. K. [Editor]. **Fifty years of forestry in the U.S.A.** Society of American Foresters, Washington. 1950. pp. x + 385 + 16 plates. 100 refs. Price $4.00.

A commemorative volume published by the Society of American Foresters on the occasion of its 50th anniversary, and containing the following chapters:—The first half-century (*R. K. Winters*); Forest protection (*H. T. Gisborne*); Silviculture (*F. S. Baker*); Forest Management (*H. H. Chapman*); Forest utilization (*N. C. Brown*); Range Management (*L. A. Stoddart*); Forest wildlife management (*W. W. Chase*); Forest influences (*B. Frank*); U.S. Forest Service (*L. F. Watts*); U.S. Department of the Interior (*J. F. Shanklin*); Other federal agencies (*S. B. Hutchinson*); State forestry (*J. S. Illick*); Industrial forestry (*W. B. Greeley*); Farm forestry (*J. F. Kaylor*); The Society of American Foresters (*S. W. Allen*); Citizen and trade associations dealing with forestry (*C. A. Gillett*); Education in professional forestry (*R. S. Hosmer*); Forest research (*S. T. Dana*); American and world forestry (*S. B. Show*).

903. *Forest Policy, General*

835. BOLTON, LORD. **Problems of post-war forestry.** *Advancement of Science, London* 7 (27), 1950 (293–6).

Discusses problems in British forestry, including the rate of re-planting, choice of species, permissible volume of felling, and regulation of thinnings.

836. ALLAN, W., and EDGERLEY, L. F. **White paper on Crown forest land (land utilization) and forestry [in Mauritius].** Government Printer, Port Louis, Mauritius. 1950. pp. 37 + map. 10 refs. Price *Rs.*1.00 (1*s.* 6*d.*).

Recommends an official policy for (1) management of forests in general, and (2) land use in Crown forest lands. The former follows closely upon the lines of the statement on forest policy laid down for Uganda [cf. *For. Abstr.* 10 (No. 3027)], with slight adaptations to local conditions, e.g. the status of 'Pas géométrique' lands (the protected strip surrounding the island).

837. KERNAN, H. S. **A forest policy for Bolivia.** *J. For.* 49 (5), 1951 (353–6).

904. *General Regional Accounts of Forests and Forestry*

See also Nos. 171, 831–4, 862.

838. Aperçus forestiers sur l'Allemagne. [**Notes on German forestry.**] *Livret du Cinquantenaire, Société forestière de Franche-Comté, Salins-les-Bains, 1946*, 1947 (51–162). [F.]

Discusses the composition, management, exploitation and production of German forests, afforestation, forest administration, recent legislation (since 1934)

and gives a more detailed account of forests and forestry in the French zone.

839. URQUHART, B. **Forests of Savoie.** *Wood* 16 (4), 1951 (154–6).

A brief account of forestry practices and local industries.

840. NIER. Aperçu forestier sur le département de la Loire. **[Forestry in the department of the Loire.]** *Bulletin trimestriel des Amis des Arbres, Roanne (Loire)* 23 (43), 1949 (13–8). [F.]

Gives figures to show the area under forest, and discusses briefly the distribution of the main species within the area, and the extent and output of the 5 chief forest nurseries.

841. BURGERS, T. F. Iets over bossen en bosbeheer in Spanje. **[Forests and forestry in Spain.]** *Ned. Boschb.-Tijdschr.* 23 (5), 1951 (131–45). 19 refs. [Du.]

842. WECK. Aus der Forstwirtschaft Schwedens nach dem zweiten Weltkrieg. **[Swedish forestry after the second World War.]** *Z. Weltforstwirt.* 13 (10/12), 1950 (183–94). 12 refs. [G.]

Notes on a study tour in 1949, covering forest statistics, policy, the national forest survey, silviculture and research organization.

843. KOCH-SCHMIDT, A. De skogliga förhållandena i mellersta och övre Norrland. **[Forest conditions in central and upper Norrland.]** *Svenska SkogsvFören. Tidskr.* 47 (5), 1949 (239–52). [Sw.]

Reasons for the present low rate of yield are discussed and measures for its improvement, including better thinning and felling systems, are recommended. Figures are given for seed requirements for reforestation and for actual seed production. It is suggested that the administrative districts are generally too large for the administrative and forest staff available.

844. GEORGOPULOS, A. Die Forsteinrichtung in Griechenland (Rückblick und Ausblick). **[Forest management in Greece (past and future).]** K. & E. Theodoridis, Thessaloniki. 1950. pp. 151. Numerous refs. [G.g.] Price [£2. 2*s*. 0*d*.]

A thesis presented to the Eidgenössische Technische Hochschule, Zürich, surveying the forest situation in Greece, with a description of the forests, a review of the development of forestry and the objects of forest management, and recommendations for future practices.

845. ANVERY, S. A. A. **Forests and forestry problems of Pakistan.** *Pakistan J. For.* 1 (1), 1951 (18–30).

846. VAHID, S. A. **A note of inspection on the forests of East Bengal.** Ministry of Food and Agriculture, Government of Pakistan. [1950?]. pp. 40 + 7 photos.

847. VILLIÈRE, A. Les forêts et les administrations forestières canadiennes. **[The forests and forest administration of Canada.]** *Rev. for. franç.* 1951 (6), (404–22 + 1 photo). [F.]

848. [GONDELLES AMENGUAL, R., and BUDOWSKI, G.] Las selvas de 'El Dorado'. **[The forests of El Dorado.]** *Agric. venez.* 15 (148), 1950 (6–7). [Span.] A.P.B.

Brief notes on the forests in this area of Bolivar state, Venezuela.

905. *Forest Statistics and Resources*

See also Nos. 575–86.

849. BUCHHOLZ, E. Statistische Übersicht der Waldverhältnisse Osteuropas mit Ausnahme der Sowjetunion. **[Statistical review of the forests of Eastern Europe, with the exception of the Soviet Union.]** *.Holz-Zentralblatt, Stuttgart* 76 (96), 1950 (1050). [G.] M.O.W.

Forested area, yearly increment and area of coniferous forests in 7 eastern European countries.

850. **Census of woodlands 1947–1949: Summary report.** *For. Rec. For. Comm., Lond.* No. 3, 1951. pp. 15. 11 tbls. Price 6*d*.

[Cf. *For. Abstr.* 11 (p. 139, Nos. 2338–9).] The principal data are given in a series of 11 tables.

851. Studi di statistica forestale. **[Studies of forest statistics.]** *Annali di Statistica, Roma (Ser. 8)* 4, 1950. pp. 262. [It.]

Contains 4 studies based on official data:—The forest area in Italy at 30 June 1947 (*G. Quattrocchi*); Economic aspects of wood utilization (dealing separately with the most important species and assortments) (*E. d'Elia*); Net forest production in Italy in 1948 with reference to geographical distribution (*D. Camandona*); and Political and economic consequences of the forest statistics (*E. d'Elia*).

852. Estadística forestal de España—año 1946–47. **[Forest statistics for Spain, 1946–47.]** Servicio de Estadística, Ministerio de Agricultura, Madrid. 1949. pp. 106 + 18 plates. [Span.]

The statistics, presented in diagram and table form, cover the area of the forests, ownership, value, work of the forest services during the year, production, imports and exports.

853. Estadística forestal de España—año 1947–48. **[Forest statistics for Spain, 1947–48.]** Servicio de Estadística, Ministerio de Agricultura, Madrid. 1950. pp. 96 + 5 plates. [Span.]

854. SCHENKENBERG VAN MIEROP, H. W. De jaarkap van populieren. **[The annual fellings of Poplar.]** *Houthandel, Schiedam* 3 (50), 1951 (483–5). *Abstr.* in *Ned. Boschb.-Tijdschr.* 23 (5), 1951 (158–9). [Du.]

Gives figures to show the volume of Poplar and fellings in Holland during and since the war.

855. [DENMARK.] Oversigt over de danske Statsskoves Udbytte af Ved og Penge for Finansåret 1949–50. **[Review of the timber and financial yields of the Danish State Forests for the financial year 1949–50.]** Nielsen & Lydiche (M. Simmelkiær), Copenhagen 1951. pp. 18 + 1 tbl. [Dan.]

856. CUMMINGS, L. J., HAIBACH, D. J., and WISE, H. F. **Forest area, volume, and growth in Japan—statistical summary.** *Prelim. Stud. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 37, 1950. pp. 132.

Data for forest land use and ownership, and the total volume and increment of sawtimber and fuelwood, are given in diagrams and tables.

857. RAM, B. S. **Note on area of forests in the East Punjab.** *E. Punjab For. Notes* 1948. pp. 3.

907. *Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc)*

See also Nos. 11–2, 36.

858. Sosa, A. H. Parque Nacional Iztaccihuatl-Popocatepetl. [**The Iztaccihuatl-Popocatepetl National Park.**] Secretaría de Agricultura y Ganadería, Dirección General Forestal y de Caza, Mexico, D.F. 1951. pp. xiii + 415 + 2 maps. [Span.]

The first of a series of monographs on the National Parks of Mexico. This one presents detailed notes on the history, geology, topography and vegetation of the area in question and includes numerous photographs.

91. LAND USE, LAND-USE POLICY (INCLUDING AFFORESTATION POLICY)

See also Nos. 288 *et seq.*, 831–2, 836, 881.

859. **FAO forestry mission to Ireland: proposed revision of Irish afforestation programme.** FAO, Washington. 1951. pp. 44 + 6 + 2 + map.

860. Prothero, R. M. **Factors affecting land use in the Tâf Fechan valley, Breconshire.** *Journal of the British Grassland Society* 4 (3), 1949 (193–200). 2 refs. O.R.E.

Includes notes on past work and suggests a future policy in grazing and afforestation of this area.

861. Špiranec, M. Izdvajanje zemljišta za pošumljavanje na tlima izvan Krša. [**Allotment of areas for afforestation on all soil types except Karst.**] *Šum. List.* 74 (12), 1950 (480–3). [Croat.]

Discusses the problem of pastures in Jugoslavia. These are almost exclusively either fallow or waste lands covered with thorn bushes, Pine, and other shrubs. Some of these areas should be afforested, others converted either to arable or to properly constituted pasture.

862. **Soil conservation and afforestation.** National Planning Committee Series, Vora & Co., Bombay. [1948]. pp. 195. Price *Rs.*6 [12*s.* 6*d.*]

Contains, in addition to the report of the Sub-Committee, the resolutions of the National Planning Committee on the subject. The report consists largely of answers to a questionnaire on land use etc. in India, and is in the following parts:—(1) Introduction (*J. N. Mukherjee*); (2) General (*J. N. Mukherjee*); (3) Soil erosion (*R. M. Gorrie*) and reclamation (*J. N. Mukherjee*); (4) Conservation of soil moisture and regulation of water supply (*J. N. Mukherjee*); (5) Soil fertility and crop production (*J. N. Mukherjee*); (6) Forests (*S. H. Howard*); (7) Forest produce (*L. R. Sabharwal*); (8) Transport (*L. R. Sabharwal*); (9) Fires (*K. P. Sagreiya*).

863. Huguet, L. Pour une colonisation rationelle des terres vierges de la Guadeloupe. (La réalisation de l'équilibre agro-sylvo-pastoral en pays tropical.) [**Towards a rational colonization of the virgin soil of Guadeloupe: striking a balance between agriculture, forestry, and animal husbandry in a tropical country.**] *Rev. for. franç.* 1951 (6), (423–31 + 2 photos). 3 refs. [F.]

Cf. *For. Abstr.* 12 (No. 1718).

92. FOREST OWNERSHIP AND OWNERSHIP POLICY

See also No. 873.

864. Heske, F. Besitz und Verpflichtung. Ein Beitrag der Waldwirtschaft zur sozialökonomischen Problematik unserer Zeit. [**Property and obligations. A contribution of forest management to the social-economic problems of our age.**] *Mitteilungen der Bundesanstalt für Forst- und Holzwissenschaft* No. 19 (*Gruppe: Forst- und Holzwirtschaftspolitik, Beiträge zum Ausbau einer Philosophie der Organik* No. 1), 1950. pp. 165. 129 refs.

865. Bayly, G. H. **Management of municipal forests [in Ontario.]** *Pulp Paper Mag. Can.* 52 (5), 1951 (141–3).

An account of the management of land purchased by a municipality for reforestation and managed by the province under agreement with the municipality.

866. Härry, H. Der Ersparnisbeitrag zur Förderung der Privatwald- und Güterzusammenlegungen. [**The supplementary subsidy for encouraging the consolidation of private forest and agricultural holdings.**] *Schweiz. Z. Forstw.* 102 (4), 1951 (216–21). [G.f.]

93. PUBLIC SUPERVISION AND REGULATION OF FORESTRY, INCLUDING LEGISLATION FOR THESE PURPOSES

See also No. 831.

867. **Forestry Bill [H.L.]** H.M. Stationery Office. 1951. pp. 26.

An Act to provide for the maintenance of reserves of growing trees in Great Britain and to regulate the felling of trees; to amend the procedure applicable to compulsory purchase orders under the Forestry Act, 1945; and for purposes connected with the matters aforesaid.

868. **Forestry Bill: debate on second reading.** *Parliamentary Debates* (*Hansard*): *House of Lords Off. Rep.* 170 (32), 1951 (391–414, 418–42).

869. Pregled zakonitih predpisov o gozdarstvu in lesni industriji. [**Review of [federal Jugoslavian and Slovenian] legal prescriptions on forestry and the timber industry.**] *Gozd. Vestn.* 8 (9/10), 1950 (285–96). [Sloven.]

870. Prasad, J. **Manual of law for forest officers.** Oxford University Press, Indian Branch, Bombay. Revised ed., 1950. pp. 151. Price *Rs.*5.80.

871. **Act to provide for the setting aside of Crown forests including nature reserves and for the protection of private forests, trees and forest produce; to establish a mining timber permit board and to control cutting and taking of timber for mining purposes; to provide for the conservation of timber resources and the compulsory afforestation of private land; to regulate and control trade in forest produce including the use of trade names and marks in connection with forest produce; to regulate and control the burning of vegetation; and for other purposes connected with the foregoing.** Government Printer, Salisbury, Southern Rhodesia. 1949. pp. 28.

872. **Forest laws of California.** Western Forestry & Conservation Association, Portland, Ore. 1950. pp. 29.

873. KALLIO, K. Maanhankintalaki ja sen metsäkysymykset. **[The Land Acquisition Act and forest problems.]** *Silva fenn.* No. 64, 1948 (117–27). [Fi.]

This lecture to a forest officers' refresher course deals with the following topics:—(1) landowners' obligations when parting with land; (2) assessments of the forest area; (3) communal forest; (4) questions of consolidation and substitution of land; (5) building timber; (6) valuation proceedings; (7) grantees; (8) prohibitions on felling.

874. GERBRANDA, G., and OMMEREN, G. VAN. Het vruchtgebruik van bossen. **[Usufructs of forests.]** *Ned. Boschb.-Tijdschr.* 23 (4), 1951 (97–103). [Du.]

Discusses the existing law in Holland and its interpretation, and suggests changes.

94. OTHER METHODS TO IMPLEMENT FOREST POLICY

943. *Co-operation. Collaboration of Forest Owners*

875. ALEEM, S. A. **Scope of co-operative forestry in East Bengal.** *Emp. For. Rev.* 30 (1), 1951 (58–63).

945.1. Advisory and Information Services, Documentation Centres

See No. 713.

945.2. Publicity, Propaganda

876. CARLSON, F. E. **Forestry via television.** *For. Cl. Quart.* 24 (2), 1951 (10–4).

Describes 'Tree Time', a televised programme produced weekly by the College of Forestry, N.Y. State University.

877. ABBOT, R. W., and MCNEEL, W. **School forests—a handbook.** *Circ. Wis. Coll. Agric. Ext. Serv.* No. 387, 1950. pp. 32.

945.3. Education. Training

878. WEIR, A. H. W. **Future forestry education.** With a comment by H. G. Champion. *Emp. For. Rev.* 30 (1), 1951 (17–21).

945.4. Research

See also No. 834.

879. **Forty years of forest research in the Northern Rocky Mountain region.** *Rep. Nth. Rocky Mt. For. Range Exp. Sta. 1950* [1951]. pp. 62.

880. **Colony of Sarawak Forest Department Research Programme, 1951.** pp. 3.

946.2. Conferences and Excursions

881. **Proceedings of the [West Punjab] forest conference held on the 9th to 13th March, 1949.** Government Printer, Lahore. 1950. pp. 215.

The following papers are printed:—Afforestation of civil rakhs (*A. A. Khan*); Afforestation in arid tracts (*F. M. Khan*); Afforestation of waste lands in Muzaffargarh District (*S.-u.-D. Ahmad*); Protection of Jhelum and Kalachitta forests (*M. Said*); The effect of grazing on the yield of Kalachitta forest (*A. A. Khan*); Shelterbelts problem in Thal tract of the West Punjab (*M. Ihsan-ur-Raman*); Shelterbelts and windbreaks (*R. M. Gorrie* and *A. A. Khan*); Protection and control of timber on rivers (*M. Khan*); Study of ecological conditions hampering regeneration in the scrub forest of Rawalpindi, Attock and Jhelum districts (*R. Ahmad*); Economics of departmental fellings in plantations (*M. M. Ahmad*); Financial aspects of improvement of agricultural land by mechanical equipment (*R. M. Gorrie*); Organization of soil conservation work and afforestation of proprietary lands (*M.M.-u.-D. Ahmad*); Afforestation of *bela* forests (*M. A. Khan*); Afforestation of canal banks (*T. Hussain*); A brief note on afforestation problems in Thal with special reference to Mianwali Tehsil (*M. Rafi*).

95. FOREST TAXATION

See also Nos. 562, 570.

882. NEWPORT, C. A. **A summary of forest taxation laws by states [of the U.S.A.].** *J. For.* 49 (3), 1951 (196–200).

96. FOREST LABOUR QUESTIONS, LABOUR QUESTIONS IN WOOD TRANSPORT AND THE WOOD INDUSTRIES

See also No. 196.

883. WALLNER, O. Den nya arbetarskyddslagen med hänsyn till dess tillämpning inom skogshanteringen. **[The new Workmen's Protection Act and its application in forest work.]** *Svenska SkogsvFören. Tidskr.* 47 (4), 1949 (204–18). [Sw.]

Among the clauses discussed are those relating to protection against injury and illness, to the employment of young persons, and to co-operation between employer and employee.

884. WALLNER, O. Betänkande med förslag till ny lagstiftning rörande förläggninger for skogs- och flottningsarbetare. **[Reflections on the draft for a new bill on accommodation for forest workers and those concerned in floating timber.]** *Svenska SkogsvFören. Tidskr.* 47 (3), 1949 (181–8). [Sw.]

97. INTERNATIONAL FOREST POLICY AND OTHER INTERNATIONAL COLLABORATION

971. *Congresses, Conferences; Excursions*

See Nos. 21–2.

References: 1. *Australian Timber Journal*, Sydney; 2. *Bollettino ufficiale del Corpo forestale dello tato*, Rome; 3. *British Columbia Lumberman*, Vancouver; 4. *C.P.P.A. News Bulletin*, Montreal; . *Conservation in the Americas*, Washington; 6. *Fire Control Notes*, Washington; 7. *Foreign Commerce Veekly*, Washington; 8. *Foreste*, Rome; 9. *India News*, London; 10. *India Record*, London; 11. *Journal f Forestry*, Washington; 12. *N.R.C.C. Res. News*, Ottawa; 13. *Nature*, London; 14. *Nederlandsch oschbouw-Tijdschrift*, Wageningen; 15. *New Commonwealth*, London; 16. *Report of the Forestry ommissioners*, London; 17. *Trees*, Cleveland, Ohio; 18. *Unasylva*, Washington; 19. *Timber and lywood*, London; 20. *Wood*, London; 21. *Wood-Worker*, Indianapolis; 22. *World Crops*, London.

Conferences. The following conferences have been arranged:—

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Aug. Symposium on symbionts in insects. (Int. Union Biol. Sci.) Amsterdam.
Aug. (tentative). Mechanical wood technology. (FAO.) Austria.
Sept. (tentative) Chemical wood technology. (FAO.) Rome.
Dec. Symposium on biometric problems in relation to the growth of plants. (Int. Union Biol. Sci.) New Delhi.

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18 Feb. onwards. British Commonwealth Scientific Conference. Australia.
22–8 July. Second International Congress of Biochemistry. Paris.

The British Wood Preserving Association held its first annual conference at Caius College, Cambridge, June. This was attended by over 100 members besides a number of visitors from abroad (**20**; July 951).

Argentina. Measures to control soil erosion have now been ordered by the Argentine Government d will include the planting of at least 2 trees per ha. by all tenants of leased land, within 3 years after e beginning of their lease. The national bank will give credits for the work, and will determine the eas to be planted. The planter must select the species to be planted from an official list (**5**; July 1951).

Barbados. A scheme for selling Barbadian furniture in New York has come up against the American eamheater', which causes the furniture to crack. Local agencies are trying to find a suitable drier at will cure Barbadian wood for New York conditions (**15**; May 1951).

Canada. The Hydraulics Laboratory of the Division of Mechanical Engineering (National Research Council of Canada) is investigating the behaviour of pulpwood logs held stationary in a stream hind booms or by a log jam. Lift and drag, as well as pressure distribution about individual model gs floating at different depths have been determined. From these data, the forces acting on full-scale gs have been calculated. The behaviour of groups of logs and the formation of log jams are also being idied (**12**; April 1951).

Some 175 microbiologists from 8 provinces met at Ottawa during 7–8 June and formed a Canadian ciety of Microbiologists (**13**; 30.6.51).

It is claimed that pontoons from pressure-creosoted plywood will be free from attack by teredo and m waterlogging. The buoyancy of a pontoon can be calculated exactly, and the number and size eded for a given load. A concentration of 24 lb. of preservative to 1 cu. ft. plywood gives complete netration, and panels can be sawn without exposing an unprotected surface. At the Bird's Eye ve Shipyards, Vancouver Island, pontoons are used to support a combined float and boathouse, and pontoons, 4 × 10 × 2 ft., of ¾-in. waterproof-glue plywood, pressure-treated with coal-tar creosote, on order by the Federal Department of Public Works at New Westminster (**3**; July 1951).

Canadians may soon be offered a sausage-like preparation made in part from a plentiful by-product the wood-pulp industry. There will be no meat in the product, but it will look and taste like meat. is estimated that it can be made to sell for 25 cents per lb. (**4**; June 1951).

Czechoslovakia. A new product for fire-proofing wood, 'Burnstop', was exhibited at the Prague ir. In addition to its fire-proofing qualities, it is said also to give protection against borers and asites in general (**8**; Aug. 1951).

Great Britain. Apart from the Dedication Scheme, grants at the present rate of £12/acre are also ilable for planting in small woods which, for the purpose of these grants, are defined as follows:— On any estate (irrespective of the total woodland area): (*a*) detached woods less than 5 acres in area;

(*b*) narrow strips and belts of woodland, i.e. those averaging 3 chains or less in width, which are detached or are only joined to larger blocks at one end; (*c*) detached woods of bad access, not exceeding 15 acres if of good shape, but up to 30 acres if the shape is bad. (*B*) On an estate with a total woodland area of less than 150 acres, all woods, irrespective of size, shape, and accessibility, provided that there is no individual accessible wood of good shape exceeding 35 acres in extent. The grants cover planting, direct sowing, and natural regeneration, and are payable in 2 instalments (**16**; 1950).

On a considerable number of estates in Scotland, the Co-operative Forestry Society (Scotland) Ltd. provides the skilled supervision required by the Dedication Scheme. It also plans, contracts for and carries out work in connexion with the purchase and sale of timber and plants. There are 3 main co-operative bodies operating in England: Northern Forests Products Ltd., covering the 5 northern counties, South Western Woodlands Association Ltd. working in the south-west of England, and Western Woodland Owners Ltd. working mainly in Hereford, Worcester and Gloucester. In Wales the only co-operative forestry society at present is the Dovey Woodlands (Coedllanau Bro Ddyfi) Ltd. which operates in the immediate vicinity of Machynlleth. The Welsh Agricultural Organization Society, however, has undertaken to organize forestry co-operative societies throughout Wales and Monmouth (**16**; 1950).

India. In a written reply to a question in Parliament on 5 June, Shri K. M. Munshi gave the following information relating to forests in the Indian Union. The area of land under forests is 207,770 sq. miles (*ca.* 128,000,000 acres) which constitutes 19·2% of the total land area. About 117,597 sq. miles (76,000,000 acres) are merchantable forest. State Governments control an area of 151,537 sq. miles (96,000,000 acres) of forest (**10**; 28.6.51).

FAO has forwarded to India 100 Casuarina cuttings from Siam for experimental planting in the sandy tracts of Madras State (**9**; 14.7.51).

A venture of possible future importance has recently been started in South India. This is the Pudukottah Paper Mill, which utilizes Palmyra [*Borassus flabellifer*] leaves and leaf stalks for the production of paper. The mill uses nearly 20,000 Palmyra leaves a day and turns out 2 tons of paper (7; 2.7.51).

The Government of India have secured the services of a foreign expert, under the technical assistance scheme of FAO, to undertake a survey of the Fir resources of the Himalayan regions for newsprint production in India. Surveys of Fir already carried out in Punjab, Himachal Pradesh and Uttar Pradesh, indicate that about 180,000 tons will be available every year for the manufacture of newsprint (**9**; 2.6.51).

Italy. In accordance with the desire of the Ministry and of the State Forestry Corps that they should have a patron saint, His Holiness the Pope has named S. Giovanni Gualberto patron of the foresters of Italy. The saint, while assiduous in prayer and penitence in a solitary and silent forest of the Tuscan Apennines, occupied himself and his monks in cultivation of the woods at a time when silviculture was hardly practised. His feast day, 12 July, will be considered the festival day of the State Forestry Corps (**2**; March 1951).

Kenya. It is hoped that the colony's first match factory, at South Kinangop, will be in full operation early in 1952, and producing 200,000 boxes a day. The factory is being granted timber-cutting concessions in the Kikuyu Escarpment Reserve (**15**; May 1951).

Mexico. Two new bureaux, one of forest conservation and reforestation, the other of development of desert zones, were created in the Mexican Ministry of Agriculture, 31 March 1951. The former will supervise all matters relating to reforestation and preservation of existing forests, the latter will have under its control all matters relating to forestry improvements in the desert zones of the country (7; 9.7.51).

Morocco. A plywood factory equipped with American machinery has started operations at Casablanca. The present production of 300 cu.m./month may be much increased later. The factory, the first of its kind in N. Africa, will employ 100 workers and will use logs of Mahogany and Okoumé from Gabon, Cameroun, and the Ivory Coast. Scarcity of water has led to the development of a special method to avoid the usual steam treatment of the veneer (**18**; Jan.–March 1951).

Netherlands. Young Douglas Firs planted out in the middle of August 1950 were severely browsed by rabbits. Further damage was prevented by surrounding each tree with a ring of straw 30 cm. wide sprinkled with carbolineum. In spite of rain and snow, the plants were still untouched in May 1951 (**14**; June 1951).

New Zealand. Under a plan for the exploitation of the Kaingaroa State Forest, bids are invited the purchase and processing of 23 million cu. ft. of softwoods to be cut annually from the forest. e Government will do the logging, but a private company or companies are to build and operate p mills and sawmills in the area. Firms offering to purchase logs must give details of the plant be erected and must provide housing for their supervisory staff; the Government will furnish housing the workers under the State Housing System (7; 28.5.51).

n connexion with the plans for opening up Kaingaroa Forest, the New Zealand government has ided to proceed with the construction of a railway to connect Murapara in the forest area, with the stal railway providing access to the part of Tauranga which it is proposed to develop. The construcn of the line will take 4–5 years and will cost *ca.* £3,000,000 including rolling stock (15; May 1951).

The damage which the rapidly increasing opossum population is causing to Westland forests has n causing concern for a long time. A bounty of 2*s.* 6*d.* has been offered on unsaleable skins, and Department of Internal Affairs has established a full-time 'killer' party on the west coast. The vernment has set aside £75,000 to bring the opossum under control and it expects that 500,000 mals will be killed on the west coast this year (1; May 1951).

Portugal. Two decree-laws were published on 8 May to increase the existing restrictions on the duction of cork and resin for the purpose of safeguarding these resources. The first provides that ining of Cork trees shall be permitted only from December till the end of March. The other limits tapping of Pine to the period March–October, and also regulates the size of tree that may be tapped d the type of cut that may be made (7; 23.7.51).

U.S.A. A member of the General Electric Research Laboratory at Schenectady is to study the rôle evergreens, particularly 'Mountain Pine', in encouraging occult precipitation, with a view to the use suitable species in reforestation of felled or burned mountain areas so as to obtain the benefits of reased precipitation (19; 9.8.51).

Farmers in several Pacific Coast conservation districts and foresters of some tree-farming concerns, s year tried out on a large scale a new walking-stick automatic tree-seed planter designed by C. S. Baker Portland, Ore. It has 2 moving parts, the seed lifter and the plunger. The seed hopper, which is ar the handle, has in it a patented seed lifter that automatically dispenses seeds as needed into the llow barrel of the stick. As each seed drops to the ground through the planting head, a plunger shes it into the soil to a depth of half-an-inch. The seed lifter is adjustable and can accommodate llets. It is estimated that one man using this implement can sow 6–8 acres a day (3; July 1951).

A co-operative project for research in the chemical barking of living trees has been begun by the New rk State University College of Forestry, nine pulp and paper companies and a chemical company. e aim of the project is to develop 'a simple, efficient and controllable technique' for loosening the rk of living trees. Other considerations are being taken into account, such as management and gging problems, retention of chemicals in the wood, and its effect on pulping and quality of the ished paper (11; July 1951).

Research is in progress at the University of California on the use of a growth inhibitor to reduce the cessary clipping of hedges. A hedge of *Pyracantha crenulata* was sprayed with an aqueous solution ntaining 0·5% of maleic hydrazide at the rate of 0·5–1 fluid oz./ sq. ft. Two months later, untreated ctions of the hedge had an average of 42·4 new shoots/ sq. ft. and the treated section only 1·3 shoots/sq. The lengths of shoots in the treated and untreated sections were 9–12 in. and 1·5–2·5 in. respectively. ere was no apparent injury to foliage or berries (17; May–June 1951).

Sitka Spruce and Redwood are displacing Spanish Cedar [*Cedrela odorata*] as cigar-box material. itation cigar-box Cedar wood is also produced by treating Basswood, Yellow Poplar, and Tupelo th an extract obtained by digesting Cedar shavings and sawdust. The wood is treated with toothed llers to give it the general appearance of Spanish Cedar, and then stained a Cedar colour (21; April 51).

It has been found that exposure of sawdust to high-speed cathode rays or electron streams will render digestible by bacterial extracts from the cow's rumen. Digestibility increases steadily up to about 12 inutes' exposure to cathode rays; after this, it begins to decrease. It is believed that electronic conrsion of sawdust for fodder could be carried out quite cheaply on a large scale (22; July 1951).

Tests made by the Michigan Forest Fire Experiment Station, Roscommon, Mich., show that Banox, commercial, non-toxic compound containing no acids, alkalis or chromate, is a satisfactory and onomical rust preventive, and that it could be used in the water carried or stored in fire-equipment ater tanks. Two pounds is enough to treat 200 gal. of water. The cost is *ca.* $12.00 for a dozen 2-lb. nisters (6; April 1951).

As part of a programme sponsored by the Southern Pulpwood Conservation Association and financed by the pulp mills, about 750 farm boys will be given a week's camping experience and a chance to learn a few of the fundamentals of forestry this summer. This is the 7th year of the project, during which more than 4,000 boys have been the guests of the pulp mills at camps operated by the State Forestry Departments in nine of the southern states (**11**; July 1951).

U.S.S.R. In March 1950 the Ministry of Forestry issued regulations for felling practice in non-mountainous forest in the four natural geographic zones, steppe, steppe-forest, mixed forests, and the northern coniferous (taiga) zone. The system for all forests on level ground is clear felling by strips; the width of strips varies according to geographic zone from 50 to 100 m. for Pine, 100–250 m. for Spruce, and 250–500 m. for broadleaved species. Adjacent stands must not be felled until the cut-over strip has been regenerated. The period allowed for regeneration is 2–5 years. In northern coniferous forest, regeneration is from seed trees left at a rate of 10–15/ha., assisted by soil scarification. No seed trees are left on other types, but regeneration is expected from existing seed and adjacent stands, supplemented by artificial regeneration. Slash disposal must take place immediately after logging. In Pine and Spruce forests the slash is burned in piles 1–1·5 m. high and wide (150–200 piles/ha.), but on thin rocky ground it is to be broken and scattered (**18**; Jan.–March 1951).

By a decree of Nov. 1949, the Ministry of Forestry advised all forest administrative units that they must have complete fire-protection plans by 1951. In addition to regular fire-protection measures it is now proposed to use silvicultural methods to make forests more resistant to fire. In the northern coniferous forests, where crown fires are a special danger, it is suggested that strips should be clear cut at intervals to enable broadleaved species (Aspen, Birch, Lime etc.) to come up and form natural barriers of fairly fire-resistant trees, which should help to convert crown fires into much more easily controlled ground fires. In steppe areas, where grass forms the chief fire danger, the aim should be to maintain forest stands at a degree of density sufficient to shade out the grass (**18**; Jan.–March 1951).

Recent examination of plantations of *Pseudotsuga taxifolia* made in the western provinces of the Ukraine, showed that this species is well adapted to the conditions there at elevations ranging from 50 to 1,000 m. above sea level. In plantations 42–53 years old, average height was 30 m., d.b.h. 30 cm., and volume/ha. 500–800 cu.m. Physical and mechanical properties of the wood are good, and it is intended to plant Douglas Fir extensively in shelterbelts etc. for timber production (**18**; Jan.–March 1951).